A STUDY ON

MADHUMEGAM

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GOVERNMENT SIDDHA MEDICAL COLLEGE

PALAYAMKOTTAI – 627 002.

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CERTIFICATE OF PARTICIPATION

This is to certify that Dr. .....S.SHIVASUBRAMANIYAM.....

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"Research Methodology & Biostatistics" for AYUSH Post Graduates &

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This is to certify that the dissertation topic "***Preclinical and clinical study on MADHUMEGAM(DIABETES MELLITUS) and the drug of choice is NEERIZHIVU CHOORANAM***" have been approved by the screening committee.

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(Kindly make sure that the minutes of the meeting duly signed by all the participation are maintained by the college office)

APPLICATION FOR PERMISSION FOR ANIMAL EXPERIMENTS

Application to be submitted to send either to the CPCSEA (Address in Form A) or Institutional Animal Ethics Committee (IAEC).

Part A

1. Name and address of Establishment
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2. Registration number and date of registration
   661/02/a/CPCSEA & 19/07/2002

3. Name, address and registration number of breeder from whom animals acquired (or to be acquired) for experiments mentioned in parts B and C. We are using the inbreed colony animals maintained by the Department Of Pharmacology, K. M. College of Pharmacy, Uthangudi, Madurai.

4. Place where animals are presently kept for proposed to be kept)
   At animal house under the control of Department of Pharmacology

5. Place where experiment is to be performed.
   At Department of Pharmacology, K. M. College of Pharmacy, Uthangudi, Melur road, Madurai – 625 107

6. Date on which experiments is to commence and duration of experiment
   1-05-2012 to 01-11-2012 (Six months)

(The appropriate protocol form for the research proposal – Part D in the case of experiments using animals other than non human primates, Part C for the use of non human primates – to be duly filled in, signed and appended to this form)

Signature

Date : 10.06.2012

Place : Madurai

I. A. E. C. CHAIRMAN
INSTITUTIONAL ANIMAL ETHICAL COMMITTEE
K. M. COLLEGE OF PHARMACY
MADURAI-625 107.

Name and Designation of

Chief Investigator

* Applicable only for application to be submitted to CPCSEA

ANNEXURE

Investigator declaration

1. I certify that I have determined that the research proposal herein is not unnecessarily duplicate of previously reported research.
2. I certify that all individuals working on this proposal and experimenting on the animals have been trained in animal handling procedures.
3. For procedures listed under item 11, I certify that I have reviewed the pertinent scientific literature and have found no valid alternative to any procedure described herein which may cause less pain or distress.
4. I will obtain approval from the IAEC / CPCSEA before initiating any significant changes in this study.
5. Certified that performance of experiment will be initiated only up on review and approval of scientific intent by appropriate expert body (institutional scientific advisory committee / funding agency / other body (to be named)
6. Institutional biosafety committee (IBC) certification of review and concurrence will be taken (required for studies utilizing DNA agents of human pathogens)
7. I shall maintain all the records as per format (Form D)

S. Sivasubramaniam

Research Scholar Signature

(Dr.S.Sivasubramaniam)

N. Chandrasekar

Name of Investigator

I. A. E. C. CHAIRMAN
INSTITUTIONAL ANIMAL ETHICAL COMMITTEE
K. M. COLLEGE OF PHARMACY
MADURAI-625 107.

(For IAEC / CPCSEA usage)

Proposal number	: Dr.S.Sivasubramanian/ MD(S)/Ph.D/KMCP/ IAEC/34.
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Date: 10.06.2012

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INSTITUTIONAL ANIMAL ETHICS COMMITTEE
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MADURAI-625 107

Signature

I. A. E. C. CHAIRMAN
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INTRODUCTION

Siddha system is considered to be one of the ancient system of medicine in the world. Siddha is a complete holistic medical system that has been practiced in India for two thousand years and above.

This system was formulated and established by the eminent spiritual power called siddhars and hence the name siddha medicine. The medicine were prepared by the various type of herbo – mineral formulations.

Siddha system emphasizes not only a healthy body and it regulate sound mind and soul.

In the recent years, India has witnessed a rapidly exploring epidemic of diabetes. Indeed, India today leads the world with its largest number of diabetic people in any given country. WHO estimates that there are 32 million people with diabetes in India in 2000, which is projected to rise to 80 million by the year 2030. Increase in prevalence is rapid in urban areas from 2% in 1970s to 12% in 2000 and in rural areas also it is now beginning to increase.

According to WHO recent estimates indicate there were 171 million people in the world with diabetes in the year 2010 and this is projected to increase to 366 million by 2030. Diabetes is a major threat to global public health that is rapidly getting worse, and the biggest impact is on adults of working age in developing countries.

World Diabetes Day, a joint IDF-WHO day of global activities which takes place on November 14th each year to raise awareness of different aspects of diabetes and its complications.

The Siddhars explained 20 types of pramega noi. Its diagnosis is based on tridhosham and panchapootham. It is described on the basis of colour, consistency, taste, smell, weight, sedimentation etc.

Madhumegam is a chronic metabolic disorder commonly known as "Neerizhivu" characterized by increased and frequent urination, which is sweet in odour, resulting in gradual diminition of udalthathus.

In the book of Theraiyar karisal urinary diseases are classified into two types.

1. Neerinai perukkal noi (Neerizhivu)
2. Neerinai arukkal noi

In my dissertation "Neerizhivu" is coming from the neerinai perukkal noi. The present study is limited to the specific type of madhumegam or enippu neer which is characterized by polyuria containing sugar.

The evidence or proof for this disease has been explained by "Yugi Munivar" in the book of "Yugi Vaidhya Chinthamani 800".

The Egyptian papyrus of Ebors (1500BC) has mentioned the malady associated with polyuria. The Greeks who know about its prominent manifestation of persistent polyuria named the disease Diabetes which means passing urine like a fountain or through siphon. Mellitus means sweetness.

The signs and symptoms of "Madhumegam" is correlated with that of "Diabetes mellitus" in modern science is DM.

In this study along with siddha aspects the criteria in the modern medicine for this disease had also been included with the available facilities in the post-graduate department an attempt has been made to install the pharmacological and therapeutical role of siddha medicines to alleviate the disease madhumega noi.

AIM AND OBJECTIVES

Aim:

Preclinical and clinical study on **Madhumegam** (Type 2-DIABETES MELLITUS) and the drug of choice is **Neerizhivu Chooranam**.

Objectives

1. To evaluate the efficacy of siddha formulation **Neerizhivu Chooranam** for decreasing the blood glucose level in the treatment of **Madhumegam**.
2. To Prepare the trial drug **Neerizhivu Chooranam** as per Siddha literature (The Pharmacopoeia of Siddha Research Medicines - Specific Medicine) and to analysis the qualitative and quantitative constituents present in the trial drug.
3. To establish the toxicological profile by performing acute oral toxicity studies and sub chronic toxicity studies on mice and rats following who guidelines.
4. To have a notion of the range of the diseases with sex, age, occupation, social status, diet, hereditary, and paruvakaalam., etc.
5. To study the Safety and efficacy of the test drug through an open clinical trial.

ABSTRACT

Since the commonest disease in the society, number of sufferers increasing day by day. So that the author had chosen the disease, **"Madhumegam"** for his dissertation work.

20- Out patients and 20 In patients of either sex were selected for the study at PG-I Pothumaruthuvam department and administered with the trial medicine.

The trial drug **"Neerizhivu hoornam"** 2 gm two times a day with butter milk was administered during the whole study period.

The trial medicine was subjected to Biochemical and pharmacological analysis.At the end of the trial study, the majority of the patients showed good results.

REVIEW OF LITERATURES
SIDDHA ASPECT
MADHUMEGAM

Siddha system of medicine is an ancient system and it deals not only with the body of man but also with the inner soul.

According to siddhars the imbalance of tridhosha causes totally 4448 diseases to human being. Among them megarogam is considered to be the emperor of diseases.

"ஆமப்பா மனிதர் செய்த கன்மத்தாலே
அரகரா மேகமென்ற ராசாவாலே"

-அகத்தியர்.

Madhumegam has been described by many siddhars in their texts. The aetiology, pathogenesis, classification, features, diagnosis and prognosis have been dealt in detail in these texts.

Synonyms of Madhumegam :-(verupeyar)

Neerizhivu, vegumoothiram, madhuprameham, inippuneer, meganeer, Thiththipuneer.

Definition:- (Iyal)

It is a clinical condition characterized by frequent passage of urine more than the normal, resulting in deterioration and diminution of seven udal thathus.

"இனிப்பான இனிப்பல்ல ஈ வந்தாடும்
ஒரு துளிவாய் விட்டார்கைப் பிணியாய் தோன்றும்"

- **குருநாடி**

The above description quotes that ant and flies are attracted to the site of voided urine and when the urine is heated it gives honey odour.

"அண்மையாயடிக் கடிக்கு நீரிறங்கு
மடிக்கடிக்கு அரைநாழி தனிலே காணும்
வெண்மையான தடியதனிற்றான் பிடிக்கும்

மிக்கான சடம் வெளுத்து மேனி கன்றும்"

-யூகி வைத்திய சிந்தாமணி

ETIOLOGY: (Noivarum vali)

a) The authentic etiological factors described by various siddhars are as follows,

"கோதையர் கலவி போதை
கொழுத்த மீன் இறைச்சி போதை
பாதுவாய் நெய்யும் பாலும்
பரிவுடன் உண்பீ ராகில்
சோத பாண்டுருவ மிக்க
சுக்கில பிரமேகந்தான்
ஒது நீரிழிவு சேர
வுண்டென அறிந்து கொள்ளே"

-அகத்தியர் 1200

The above poem quotes that erosive intake of rich food like ghee, fish, milk, toddy and excessive indulgence in sex leads to madhumegam. The same also discussed in "Yugi Sinthamani".

"உற்பவிக்கும் பால் நெய்யால் இறைச்சி கள்ளால்
வுரிசையாய் மீன்தன்னாய் அருவிருந்த
மற்பவிக்கும் பதார்த்தத்தால் மதுரவஸ்தால்
மந்தங்கள் தனைபுசித்தல் வேகாப் பண்டங்
குற்பவிக்கும் குளுத்த வன்ன மங்கை கோஷ்டி
குறித்த நித்திரை தவிர்தல் அக்கினி மந்தம்
தற்பவிக்குந் சரீரந்தான் மிகப்பருத்தற்
சஞ்சலந்தான் மிகப்பயத்தால் தரிக்கும் நோயே"

- **யூகி வைத்திய சிந்தாமணி**

Yugimuni in his text attributes this disease due to injudicious diet containing rich fat, sweet and also obesity. Too much of sedentary habits without exercise also leads to madhumegam, undue fear, severe depression has also emphasized for the development of madhumegam.

b) Hereditary factors:-

Statistics indicate that those with family history of diabetes have higher (25-35%) risk than those without such background.

"பேறு இளமை இன்பம் பிணி முப்பு சாக்காடு
ஆறும் கருவில் அமைந்த படி
முறை கேட்கில் ஒன்பது முயற்சியால் வந்தது
துறை கேட்கிற கருப்பத்திற் றுவங்கிய மேகங்கள்
நரை பூத்த கொங்கையாள் நாயகன் மோகத்தால்
மறைபோற்றுங் கருப்பத்தில் வளர்ந்தது மேகமே"

-திருமூலர்

"உற்றிடும் உலகத்தோர்க்கு உறுபல வியாதியெல்லாம்
பற்றிடும் குணங்கள் தன்னை பகர்ந்ததுரை செய்யவேண்டும்
ஒத்திடும் சனனவாறும் உடலுயிருனவாரும்
அந்தி மாமலையின் வாழும் மாமுனி வகுத்ததாமே"

-அகத்தியர் குரு நாடி சாத்திரம்

C) Sexual indulgence:

"கன்னி மயக்கத்தால் கண்டிடு மேகமே"

- நாடி நூல்

"கிரந்தி புண்ணீரன மேக கீசகனெனுந் துன்மார்க்கன்
அருந்ததி என்னும் பாஞ்சாலி யன்னையை கண்ணுற்றானே"

-தேரன் மருத்துவபாரதம்

"ஸ்திரீபோகம் செய்ததினால் வேவு கொண்டு
சிரசுமட்டும் வெந்துருகி கனலே மீறிக்
குறியுடனே மேகந்தான் கொடுமை செய்து
குறைந்து வரும் தாதுவெல்லாம் குன்றிப் போகும்"

-குருநாடி

From the above poem, all siddhars attribute diabetes mainly due to excessive indulgence in sex which results in depletion of total strength of body as a whole, making the individual susceptible to this disease.

d) Psychomatic factors:-

Yugimunivar and other siddhars said stress is a great importance to psychosomatic factor. All antisocial activities ultimately result in

subjective guiltiness and psychosomatic stress resulting in disease like diabetes, peptic ulcer and hypertension.

"மதங்கொண்டு பெரியோரை வைகையாலும்
மாதர் கற்புநிலைமை தன்னை அழிக்கையாலும்
பதங்கொண்ட சிவயோகி சாபத்தாலும்
பத்துவகை சிலேற்பனங்கள் மேகநீராம்"

- யூகி வைத்திய சிந்தாமணி

e) Kanma Noi:-

"தானே பூருவ விதியதனாற் சாரும் பிணிகளல்லாமல்
மானோர் விழியார் வேட்கையினால் வருந்தும் பிண்ணும் பசியாலே
தானே பொறுத்து உண்கையினால் தாகந் தன்னால் மிகச்சார்ந்து
தானே கமலம் புண்ணாகிச் செய்யும் பிரமியச் செயல்தானே"

-தேரையர்வாகடம்

"ஆமப்பா மனிதர்செய்த கன்மத்தாலே
அரகரா மேகமென்று ராசாவாலே
காமப்பால் வீதததாற் வருங்கன்மத்தாலே
கைக்கடங்கா நோய்கள் வருங்கன்மத்தாலே
போமப்பா மேகம் வந்த காரணந்தான்"

-அகத்தியர் கன்ம காண்டம்

In the views of Theraiyar, Agasthiar, Thirumoolar, madhumegam also occurs as a result of bad deeds committed in his or her past.(or their previous births)

Noi Enn (Classification):-

"அல்லு மென்றே மேகமது இரண்டுபத்து
மகிழ்ந்து நீ கேளுமென்று வசனித்தாரே"

- யூகி வைத்திய சிந்தாமணி

"கழியும் வாதம் நான்காலும் காயும் பித்தம் ஆறாலும்
சுழியும் சேத்துமம் பத்தாலும் சொல்லும் நாலஞ்சாய்த்
வழியும் வாதம் நான்காமே மாறா தவிழ்தால் தன்னாலே
பொழியும் வாதம் நில்லாது போமே மருந்தைப் பொய்யெனவே"

-தேரையர் வாகடம்.

நீரிழிவு நோயை மேகநீர்நோய் என்று வழங்குவதும் அது வளிக்குற்றத்தால் பிறப்பன நான்கு, அழற்குற்றத்தால் பிறப்பன ஆறு, ஐயக்குற்றத்தால் வருவன பத்து ஆக மொத்தம் இருபது பரிவுகளென மேகநீர் நோயை வகுத்துள்ளார்கள்.

வளிக்குற்றத்தால் வரும் மேகநீர் நோய்:

பொதுக்குறிகுணம்:

பொதுவாக கை, கால், கண், உடல் இவை அழல் போல் எரியும், நாவறளும், பல், நா, தொண்டை இவை கறுத்து இருக்கும். பேச்சுவன்மை குறையும், கண்கள் மேல்நோக்கும், அடிக்கடி பசியும், நீர்வேட்கையுமுண்டாகும், உடல் முழுமையும் வலி எடுக்கும்.

வளிமேகநீர்கள்:

4 வகைப்படும்

- நெய்மணநீர்
- பசுநீர் மணநீர்
- ஊன் மணநீர்
- இளமறிக் கொழுப்பு மணநீர்

அழல் குற்றத்தால் பிறக்கும் மேகநீர் நோய்கள்:

"அறியவே பித்தசலமாறுமே தான்
அங்கமதிற் செய்கின்ற குணத்தைக் கேளாய்
தறியவே உடல்வற்றி எரிவுண்டாகும்
சடத்திலுந்தான் நீரிலுந்தான் கவிச்சுண்டாகும்
தெறியவே சீப்போலுங் கற்றாழை போலுந்
சேல்போலுந் தேன்போலு நாற்றமுண்டாம்
வெறியவே பீசத்திற் கோசத்தில் குத்தல்
மிகுமீரல் நாபியிலும் வேக்காடாமே"

"வேக்காய் விரணமுண்டாய் வாய்தானாலும்
விக்கலோடு அருதியாய்ச் சுரமுண்டாகும்
தீக்காடாய் தேகந்தான் கிடக்கொட்டாது
தியக்கமொடு மூர்ச்சையுண்டா மயக்கமாச்சே
சாக்காடாய் நாவறளுங் கண்ணீர் தாகஞ்
சாத்தியொரு சரீரமெலாந் தளர்ச்சி யாகுந்

தாக்காடாய் மலசலந்தான் மிகவுண்டாகுந்
தாக்காடாய் மலசலந்தான் மிகவுண்டாகுஞ்
சமகுணந்தான் பித்தசல மாறுமாச்சே”

-யூகிவைத்திய சிந்தாமணி

பொது குறிகுணங்கள்:

பித்த குற்றத்தலுண்டாகும் மேகநீர் நோயில் உடல் முழுமையும் வெப்பு உண்டாய் எரிச்சல், உடல் வறண்டு சுருங்கல், உடல் வியர்த்தல்,

சிறுநீர் தேன்மணத்துடன் இருத்தல், நீர்ப்புழை, விரை, ஈரல், உந்தி, இவ்விடங்களில் வேக்காடு உண்டாதல் முதலிய குறிகுணங்களை தோற்றுவிக்கும்.

பித்தமேகநீர் நோய்கள்

இது ஆறு வகைப்படும்

- யானை கொழுப்பு மணநீர்
- கற்றாழை மணநீர்
- சுண்ண மணநீர்
- தித்திப்பு நீர்
- பளிங்கு நீர்
- முயற்குருதி நீர்

ஐயக்குற்றத்தால் பிறக்கும் மேகநீர்நோய்கள்:

“தசமான பத்துக்குங் குணத்தை கேளாய்
சரீரந்தான் பருத்துமே வெளுப்புண்டாகும்
அசமான தினவுண்டா மடிக்கடிக்கு
கசமான விருமலுடன் கோழை யுண்டாங்
கனவரிவா யாயாச முழலையாகுங்
குசமான குணங்களையெல்லாம் சிலேட்டுமந் தன்னில்
கொடிய சலக்குணமென்று கூறினாரே”.

-யூகிவைத்திய சிந்தாமணி

பொதுகுறிகுணம்:

ஐயக்குற்றத்தினால் உண்டாகும் மேகநீர் நோய்களின் பொதுவாக உடல் வெளுத்தல், உடல் பருத்தல், சொறிசிரங்கு, தினவு முதலியன உண்டாதல், அடிக்கடி அன்னமும் நீரும் மிகுதியாக அருந்தல், இருமல், தொண்டையில்

கோழை கட்டல், உடலெரிச்சல், நீர்வேட்கை முதலிய குறிகுணங்கள் உண்டாகும்.

ஐயமேகநீர் நோய்கள்: இது பத்து வகைப்படும்

- நிணம் மிதக்கும் நீர்
- தெளிநீர்
- மூளை நீர்
- இளநீர்
- கள் நீர்
- சுக்கில நீர்
- கழுநீர்
- தேன்நீர்
- உப்புநீர்
- இறைச்சி நீர்

Agasthiyar kanmakaandam 300:

"நலமான பேர்தொடுத்து சொல்லக்கேளு
நல்ல கெந்தன் உருத்திராங்கன் இந்திரகண்டி
குலமான சலோத்திரன் பச்சைவண்ணன்
கொடிய ருசிகன் சிலாங்கன் ரெத்தவண்ணன்
பெலமான பீதவண்ணன் ரத்தினவண்ணன்
பேசரிய சம்பிராசன் அனந்த நாமன்
அனந்தனோடு நீலகண்டன் தவளவண்ணன்
அதிபிரமன் மதுமேகன் அத்தனோடு
சினந்தணிக்கு எலும்புருக்கி புட்பராசன்"

மேகநோய்கள்	**மணம்**	**சுவை**	**முக்குற்றநீர்**
கெந்தன்	மாம்பூவாசம்	புளிப்பு	வாதசலம்
உருத்திரங்கன்	தாழம்பூவாசம்	இனிப்பு	சிலேத்துமநீர்
இந்திரகண்டி	செண்பகபூவாசம்	நாகவிடருசி	சிலேத்துமநீர்
சலதோத்திரன்	குங்குமபூவாசம்	கைப்பு புளிப்பு	-
பச்சைவண்ணன்	தசைநாற்றம்	அதிக தாகம்	வாதபித்தநீர்
ருசிகன்	பானகம் வாசம்	அதிக கைப்பு	பித்தநீர்
சிலாங்கன்	காடிநாற்றம்	கைப்பு புளிப்பு	வாத நீர்
ரத்தவண்ணன்	உதிரவாசம்	இனிப்பு	கபநீர்
பீதவண்ணன்	உப்புநாற்றம்	உப்பு	பெரும்பித்தநீர்
ரத்தினவண்ணன்	அலரிப்பூவாசம்	-	வாதபித்தநீர்

சம்பிராசன்	கோமூத்திரம்	அதிமூத்திரம்	பித்தவாத நீர்
அனந்தன்	சர்மவாசம்	சீனிருசி	கபநீர்
நீலகண்டன்	அதிகமூத்திரநாற்றம்	எறும்பரிக்கும்	கபபித்தநீர்
தவளவண்ணன்	காணாகம்வீசும்	சர்க்கரை இனிப்பு	கபநீர்
பிரமன்	பந்தனவாசம்	மிளகுஉறைப்பு	பித்தவாதநீர்
மதுமேகன்	கள்நாற்றம்	புளிப்பு	கபபித்தநீர்
அத்தன்	பால்நாற்றம்	வெண்ணெய்ருசி	வாதநீர்
எலும்புருக்கி	சுண்ணநாற்றம்	சுண்ணருசி	பித்தநீர்
புட்பராசன்	மல்லிகைபூவாசம்	கரித்தல்	பித்தநீர்

Noi kuri kunangal (clinical features):

"சரியாக மேகத்தால் அபான வாயு
தான் புகைக்கு மேலேறிக் கபாலச்சூடாம்
பெரிதான மேகத்தால் அத்தி வெந்து
போமப்பா தசைவெந்து ரத்தம் வற்றிப்
பரிவாகித் தசவாயுவால் மந்தங்கொண்டு
பெருந்தீனி மலபந்தம் உதானவாயு
வரிவாகித் தேகமெல்லாம் விடநீராலே
மெய்யழிந்த மேகமென்ற திருபதாச்சே"

-சித்த மருத்துவம்

அளவு கடந்த பசி தாகம் என்னும் குறிகளைக் காட்டி பசி கொண்ட அளவு புசிக்கினும் உடல் வன்மை பெருகாது, நாளுக்கு நாள் மெலிவடைதல்.

நீர்வேட்கையைத் தடுக்கும் பொருட்டு பருகும் நீரின் அளவிற்கு ஏற்ப சிறுநீர் இறங்குதல், தூக்கமின்மை, மனக்கலக்கம், பிசுபிசுத்த வியர்வை, இளைப்பு

பெருமூச்சு மயக்கம் என்னும் முற்குறிகளை காட்டி நோய் வன்மையில் மிகும்.

Premonitory symptoms :-

- Thirst
- Excessive hunger
- Polyuria
- Body Pain
- Tiredness

Signs and symptoms:-

Yugimuni has described the signs and symptoms of madhumegam as followed

"கூறான மேகமது இருபதுக்கும்
குணந்தனை சிவன்சொல்ல தேவிகேட்க
தாறான தாகமொடு சோக மேகந்
தரியாமல் நீரிழிதல் இருமல் முச்சு
ஆறானஅருசி சத்தி சித்த பிரமை
அடிக்கடிக்குத் தண்ணீர் தானன்னங் கேட்டல்
ஈறான இடுப்புகள் கடுப்பு காணல்
எலும்பு முற்றலழற்றலோ டெரிவுண்டாகும்"

"எரிவோடு சரீரமெல்லா மறைபட்டாற் போல்
எழிழுடம்பு நோதல் நித்திரை யில்லாமை
மனது சஞ்சலப்படுதல் காற்று வேண்டல்
மெரிவோடு மேல்முச்சு மிகவுண்டாதல்
விக்கலொடு மயக்கந்தான் மெத்தக் காணல்
தெரிவோடு தேகமெங்கும் வெளுருண்டதால்
தேகமெத்த வாலோபப்படுதல் காணே"

"தண்மையாய் சலந்தானும் பசுப்பு மஞ்சள்
தானிறங்கும் பீசமும் கோசமுங் கடுக்கும்
அண்மையாயடிக் கடிக்கு நீரிறங்கும்
அடிக்கடிக்கு அரைநாழி தனிலே தாணும்

"வெண்மையாய் யடியதனிற்றான் பிடிக்கும்
மிக்கான சடம்வெளுத்து மேனிகன்றும்
பண்மையாய்ப் பஞ்வாண்டதனிற் கொல்லும்
பகிர்கின்ற மதுமேகத்தின் பாங்கு தானே"

-யூகி சிந்தாமணி

The urine thus passed is cold ,slimy touch, has brownish yellow colour, produces white sediments which adhere to the bottom of the

vessel. The skin is pale and there is generalised tenderness. If it is diagnosed in time and not instituted proper treatment with diet restriction, the disease will run a fulminating course.

In Agasthiyar Aayulvagadam:

"முகமே காந்தி நெஞ்சுலர்ந்து முறுத்து
முடலு நடுங்கி நகமே பரிந்து சீர் நெகிழ்ந்து
நஞ்சுண்டவர் போல் தேகம் சோர்ந்து பகலுமிரவு முருக்கியுடல்
பகறுமேனியும் தளர்ந்து மிகவே தாவணமுண்டாகும்"

In this poem burning sensation on hands, legs, Face, dryness of mouth, giddiness, general weakness, tiredness, tremors, loss of appetite, sweating, pallor of skin are mentioned.

Avathaigal [Complications Of Madhumegam]:

"காணவே முதலவத்தைச் சரீரந் தானுங்
கனமாகப் பருத்திறுகி நீர்த்து வாரம்
வேணவே வேண்டாக்கி யகலம் பண்ணு
மிக்கவரண் டாமவத்தை விளம்பக் கேளாய்
மூணவே மூத்திரப்பீ டையுமாச் சுக்ல
முகமுழுகித் தேஜசுதான் மிகவே குன்றும்
நாணவே மூன்றாகு மவத்தைக் குத்தான்
நாவறளும் வாயுவது மீறுந் தானே"

"தானான நாலவத்தை யங்க தாகஞ்
சன்னியது பாதமுண்டா மைந் வத்தைத்
தேனான நீர் பெருகுந் தாதுநஷ்டம்
நிலையாற மவத்தையுடற் கிடைகொள்ளாது
மூனான மூர்ச்சைவரு மேழ வத்தை
மிக்கவரோ சகஞ்சுவாசந் தேக சாட்டியம்
ஏனான எட்டாவ தவத்தை தானே
எழுகிரந்தி பிளவை யுந்தான் மிகவுண்டாமே
உண்டாகு மொன்பதா மவத்தைக் கேளாய்
உழக்கான வதிசாரங் கிருமி யுண்டாம்
பண்டான பத்தாந்தா வைத்தை கேளாய்
பாரமாம் சயங்கண்டு பரத்துக் கேகும்".

-யூகி வைத்திய சிந்தாமணி

Yugimuni has described the complications of madhumegam as Avathaigal.

Avathaigal 10:-

1. First symptom for meha disease is obesity and dilatation of urethral canal.
2. Body becomes dry and loses its lusture due to excessive secretion and flow of urine mixed with vital fluid (Semen).
3. Dryness of tongue and distension of abdomen due to formation and accumulation of excessive gas.
4. Delerium (toxic Condition) supervenes following dehydration due to excessive elimination of tissue fluid.
5. Restlessness due to loss of vital fluid in urine.
6. Breathlessness and restlessness.
7. Nausea, tastelessness, laboured breathing, exhaustion.
8. carbuncle and multiple abscess formation .
9. Maggot formation and generalised emaciation.
10. Intractable troublesome, cough with profuse expectoration leading to death.

The above complications occur in undiagnosed and improperly treated cases. The complications of madhumegam described in siddha text is really correlates with diabetes mellitus in modern medicine.

Mukkutra Verupadugal:-

"பகர்பித்த விந்தையலாது மேகம் வராது"

-தேரையர்

"குறியுடனே மேகந்தான் கொடுமை செய்து
குறைந்து வந்து வருந்தாது வெல்லாங் குன்றிப் போகும்"

-பதிணென் சித்தர் நாடி நூல்

In case of Madhumegam Pitham is affected first and then Vaatham is affected. Finally Kabam is affected. So, all the three Uyir Thathus and seven Udal thathus are affected.

Gradually body become emaciated and these are excreted through urine. The severity of the disease is measured by the functions of three dhosha and seven thathus.

As per siddha system of medicine the body is madeup of panchabhoothas. Three Primary naadies idakalai, Pinkalai, Suzhumunai respectively combined with abanan, pranan and smanan.

Idakalai	+	Abanan	→	Vatham
Pinkalai	+	Pranan	→	Pitham
Suzhumunai	+	Samanan	→	Kabam

Normally these three factors tend to be in their states of equilibrium (1:½:¼) but at times they are susceptible to imbalance and such alteration leads to disease state.

Mukkutram:-

- Vaatham
- Pitham
- Kabam

Vaatham:-

Vaatham is the primal constituents of living body whose structure is vayu + Agayam. It maintains the cohesive unity of the body as a whole.

Types of Vaatham:-

Vaatham is just like a Air but it also causes motion energy and sensation in the body. It is further divided in to ten types.

- **Pranan**
- **Abanan**
- **Viyanan**
- **Udhanan**

- **Samanan**
- **Nagan**
- **Koorman**
- **Kirukaran**
- **Devathathan**
- **Dhananjeyan**

In case of madhumegam, following types of vatham are affected

Abanan	-	Polyuria
Viyanan	-	Burning sensation and numbness over the plantar Surface of the foot
Udhanan	-	thirst, nausea, vomiting
Koorman	-	Disturbances of vision
Kirugaran	-	Excessive hunger, dryness of tongue

Pitham:

The main function of pitham which represents agni. It's function is thermo genesis or heat production, metabolism and process of digestion etc.

Types of Pitham:

It is divided into **five** types,

1) **Anarpitham:**
2) **Ranjaga pitham:-**
3) **Pirasaga pitham:-**
4) **Sathaga pitham:-**
5) **Aalosaga pitham:**

In case of mathumegam following types of pitham are affected

Anarpitham	-	Polyphagia
Aalosaga pitham	-	Blurring of vision

Kabam:

The detoriation of the two main kutram also accompany the kabha kutram which structure is Earth + water and is concerned with the digestion of food and lubrications of joints etc.

Types of Kabam:

It is divided into **five** types,

Avalambagam:

Kilethagam:

Pothan:

Tharpagam:

Santhigam:

In case of madhumegam following types of kabam are affected

Kilethagam	-	Increased appetite
Avalambagam	-	Impaired heart function

Udal Kattugal:-

Disturbance in vatham, Pitham and kabam gets reflected on udal thathus leading to disease. The seven udal thathus that supports the body in their state of equilibrium are as follows.

1) **Saaram:**

Strengthens the body and mind.

2) **Senner:**

It gives power, knowledge and boldness.

3) **Oon:**

It gives structures of the body and responsible for movements of the body.

4) **Kozhuppu:-**

It lubricates the joints and other parts of the body to facilitate functions.

5) Enbu:

It is responsible for the posture and movement of the body and protect the internal organs.

6) Moolai:

It nourishes the bone and gives strength to the body.

7) Sukkilam/ Suronitham:

Responsible for reproduction.

In case of madhumegam all udal kattugal affected

Saram	-	Tiredness
senner	-	Weakness
Oon	-	Weight loss
Kozhuppu	-	Obese or weight loss
Enbu	-	Joint pain
Moolai	-	Affected
Sukkilam	-	Excessive flow of urine mixed with vital fluid

Kosam:

1) Annamayakosam:-

Made by 7 udalthathukkal i.e the physical frame maintained by food and nourishments.

2) Piranamayakoam:-

Piranan + Kanmenthiriyam

3) Manomayakosam:-

Manam + Gnanenthiriyam

4) Vingnanamayakosam:-

Puddhi + Gnanenthiriyam

5) AnanthamayaKosam:-

Piranan + Sulutthi

Udal Vanmai:

Udal vanmai means the body resistant to a disease because of the formation of humoral antibodies that is called immunity.

Iyarkai vanmai:

Natural immunity of the body present in birth onwards.

Seyarkai vanmi:

Improving the health by nutritious food, medicines, karpams, vaccines all fall in to this category of increasing the immunity by human measures.

Kala vanmai:

Developing the immunity and stamina according to the age of the person, season and evironment.

Piniyarimuraimai (Diagnosis):

To deal one disease and confirm what is what, diagnosis is made out. It is very helpful to take over. Correct line of treatment and assess the progress of the disease.

In siddha medicine the diagnosis is based upon the following methods.

- Poriyal aridhal
- Pulanal aridhal
- Vinathal
- Envagai thervugal
- Naadi paritchai

These also comprises some other parameters to confirm the diagnosis, These are Thinai, kaalam, Udal vanmai, Mukkutrangal, udalkattugal.

Poriyal arithal and pulanalarithal:

Pori is considered as the five sense of perception namely skin, Tongue, Eye, Nose, Ear.While pulan are five objective senses. These are Touch, Taste, Vision, Smell, Hearing.

Gnanendriyam:

Organ	**Sensory function**
Mei	Touch
Vai	Taste
Kan	Vision
Mooku	Smell
Kaadhu	Hearing

In case of madhumegam, touch (numbness and burning sensation over the foot) and vision (Blurring of vision, cataract, glaucoma) affected.

Kanmendhriyam:

Organ	**Function**
Kai	Movements of upper limbs
Kaal	Movements of lower limbs
Vai	Speaking
Eruvai	Defaecation
Karuvaai	Reproduction

Alavai Nool:

Alavai methods are very much used for the purpose of diagnosing a disease. Among the ten the first three are very important and helpful in the examination of patients.

Kaandal:

This disease can be suspected by emacication or obesity, collection of large volume of urine, diabetic ulcer etc.

Karuthal:

when the patient complaint of polyuria, polydipisa, polyphagia, loss of body weight etc.

Urai:

"இருமிய பித்தம் வாதம் கூடில்
மருவு சலமேகம் வாருதி போலாடும்
உருவம் வேறாடு முண்டவுடற் காய்ந்திடும்
உருகவே வுனோடு உறிஞ்சு இனிக்குமே"

-திருமூலர்

In addition to the above clinical manifestations the pithavatham nadi felt in the Madhumegam.

Vinathal:-

It has the procedure for gathering information about the patients

In madhumegam vinathal is very much useful for piniyarimuraimai.

Kaalam:

The period of human life in 100 yrs this has been divided in to three stages. First stage vatha period, Second stage pitha period, third stage kabha period.

33yrs 4 Months - Vatham
33yrs 4 Months - Pitham
33yrs 4 Months - Kabam

Thinai:-

Nilam is classified into five types depending on the surrounding vegetation. Landscape and ecological state.

Kurunji	-	mountain and its surroundings
Mullai	-	Forest and its surroundings
Marutham	-	Field and its surroundings
Neithal	-	Sea and seashore
Paalai	-	Desert and its surroundings.

Madhumegam is prevalent in all types of land.

Envagai Thervugal:-

"அன்பான சாத்திரங்கள் அறிய வேண்டும்
அன்பான நாடிதனைப் பிடிக்க வேண்டும்
குன்றான மலைபோன்ற நாடியெல்லாம்
குறிப்புடன் அசாத்தியமுஞ் சாத்தியங்கண்டு
தன்றான அட்டவித பரிட்சை கண்டு
தக்கான குணங் குறிகள் யாவுந் தேர்ந்து
வன்றான வாகடத்தின் நுணுக்கம் பார்த்து
வளமாக பிணியதனைத் தீர்ப்போர் தாமே"

- யூகி வைத்திய சிந்தாமணி

"நாடி ஸ்பரிசம் நா நிறம் மொழி விழி
மலம் முத்திரமிவை மருத்துவராயுதம்
மெய்க்குறி நிறந்தொனி விழி நாவிருபாய் கைக்குறி"

-தேரையர்

"தரணியுள்ள வியாதிதன்னை யட்டங்கத்தால்
தானறிய வேண்டுவது யேதெனவென்னில்
திரணிய தோர் நாடி கண்கள் சத்தோடு
தேகத்தினது பரிசம் உருணம் நாக்கு
யிரண மல முத்திரமா விவைகளெட்டும்
யிதம் படவே தான் பார்த்துக் குறிப்புங்கண்டு
பருணருளால் பார்த்துக் குறிப்புங்கண்டு
பண்பு தவறாமல் பண்டிதா செய்வீரே

-குணவாகட நாடி

The unique diagnostic principle in siddha system of Medicine is Envagai thervugal

- ❖ Naadi
- ❖ Sparism
- ❖ Naa
- ❖ Niram
- ❖ Mozhi
- ❖ Vizhi
- ❖ Malam
- ❖ Moothiram

Naadi:

Naadi is responsible for the existence of life and can be felt one inch below the wrist on the radial side by means of palpation with the tips of index, middle and ring finger corresponding to vatham, pitham, kabam.

Normally the three humours vatham, pitham and kabam exist in the ratio 1: ½ : ¼ Any variation in these ratio leads to disease and it is diagnosed by Naadi.

Naadi in madhumegam:-

"இருமிய பித்தமும் வாதமும் கூடில்
மருவுல மேகம் வாருதி போலாடும்
உருவம் வேறொரு முண்டவுடற் காய்ந்திடும்
உருகவே வூனோடு உறிஞ்சி இனிக்குமே"

-திருமூலர்நாடி

The pitha and vatha variation is indicated clinically by excessive hunger, thirst, emaciation and passing of large quantities of urine.

"இனிக்கின்ற வாதத்திடை சேரில் ஐயந்தான்
பனிக்கின்ற கள்ளுப் பதனிபோல் நீரோடும்
கனிக்கின்று மேனி கரைந்து வெளுப்பேறும்
கனிக்குமது மேகந் தப்போதையாமே

-திருமூலர்நாடி

When the aggravated vatha nadi combines with aggravated kabha nadi, there is genesis of meha disease in the body. In the affected individuals body is emaciated thin and pale.

"பார்த்திடு முன்றும் பதிந்து மெலிந்து நிற்கில்
தேர்ந்திடு மேகம் வந்தோன்றியே பொருந்தி மெய்யில்"

-திருமூலர் நாடி

In madhumegam, three Naadis are feeble and weak.

"பற்பிடிக்க மேகம் என்றால் பித்தமீறும்
பாலகனே காங்கை கொண்டு நீராம் பாரே"

-பரிபூரணநாடி

Any alteration in vatha, pitha, kabha leads to meganeer disease.

"துரணமுடன் நீர்ப்பாடு கெர்ப்பப் பாடாணாற்
சொல்லுகிறேன் நாடியெல்லாந் கழன்று காணும்"

-பரிபூரணநாடி

"நீர்மேகமானவர்க்கு நாடி தானும்
நீர்மயமாய் நாடியெல்லாம் பலமே கெட்டுக்
கார்மேகம் போலேவந் தெரிமேல் புரண்டு
விழும்புழுப் போலவே புரண்டு காட்டும்"

-பரிபூரணநாடி

Sparisam (Palpation):

The following features can be found out by sparisam. Dryness of the skin, oedema, diabetic ulcer.

Naa (tongue):

In the examination of tongue its colour, coating, dryness, salaivation, deviation, movement, taste and the conditions of teeth and gums are also to be noted.

In mathumegam dryness of tongue due to excessive loss of water and electrolytes.

Niram (Colour):

The colour of the skin, nails, hair, conjunctiva, teeth and mucous membrane all are to be noted.

Mozhi(speech):

Here the quality of the voice is assessed whether of nasal character, shrill, hoarseness, slurred inarticulated. Types of aphasia whether expressive or comprehensive dysphonia all are to be noted.

Vizhi (Eye):

Both sensory and motor disturbance are noted. In madhumegam visual disturbances (blurring of vision, glaucoma, cataract) may be present in some cases.

Malam (faces):

In the examination of malam its nature whether it is solid, semisolid or liquid and its colour and quantity also be noted. Other findings such as diarrhoea, constipation, presence of blood, mucous membrane, undigested food and odour all are to be noted.

Moothiram (urine):-

In the examination of urine , its colour, odour, quantity, presence of frothy, blood, pus, Inorganic sediments, abnormal constituents such as sugar, protein etc. And the frequency of micturitions are to be noted.

Methods of urine examination:-

- ❖ Neer kuri
- ❖ Neikuri

Collection of urine:-

Prior to the day of urine examination the patient should be advised to take a balanced diet and rest. The first urine of the patient is collected in glass container.

The colour of urine is noted and a drop of gingelly oil is added in to the container and the tendency of spread is noted with in 1 ½ hour.

Though the urine should be examined only according to the rules and regulation, at time of emergency these can be relaxed.

Neerkuri of Madhumegam is studied as follows:-

1. Niram:

Clear and white. This is due to kabha variation.

2. Edai:

Consistency of urine is just like honey.

3. Manam:

Just like a honey, ants and flies are attracted towards the voided urine.

4. Nurai:

At the time of urination, urine may have frothy appearance.

5. Enjal:

Large quantity of urine is passed.

If the urine is lightly transparent it indicates the vitiation of kabha in which the prognosis is said to be very bad.

"வெண்மையுற்று மிகத் தெளிவுடைத்தேல்
உண்மையாந் சுத்த சீதளத் துதகமார்
இந்நீர்ப் பசப்படாதித்வனுடைய யுந்தரம்
முந்நீர் பெருக்கமழிவான் உய்தவொக்குமே"

-தேரன்

"புண்ணீர் மேகப்புண் கண்மாப்பிணி
நுண்ணில் நித்திய நாதியம் ஆமெனும்

-நித்திய நாதீயம்

Neikuri:

A drop of gingelly oil is dropped in to a wide vessel containing the urine to be tested and kept it under the sunlight. The variations of three thathus in disease can be diagnosed by the behavior of gingelly oil on the surface of urine.

"அரவெண நீண்டின் அஃதே வாதம்"

The drop of oil spread like a snake, it indicates vatham.

"ஆழி போற் பரவின் அஃதே பித்தம்"

if the drop of oil spread like a ring it indicates pitham.

"முத்தொத்து நிற்கின் மொழிவதன் கபமே"

If the drop of oil assumes a pearl shape, it is presumed to be kabha.

By the careful examination of the urine with gingelly oil, the physicians can know whether the disease is curable or not. For this purpose siddhars explained various spreading tendencies of oil on urine surface of define prognosis of disease.

Noi kanippu vivadham: (Differential diagnosis):

1. Thelineeer:

The signs and symptoms of the thelineer were polyuria (Voided urine is clear and snow like appearance), Polydipsia, loss of appetite, loss of body weight, and dryness of skin, constipation or diarrhoea, muscle cramps.

Due to the presence of loss of appetite and absence of excessive sugar in blood and urine sample, this disease can differentiated from madhumegam.

2. Due to prolonged intake of diuretics:

Due to the history of prolonged intake of diuretics the patient may have symptoms of polyuria. But due to the absence of excessive sugar in blood and urine sample the symptoms can be differentiated form madhumegam.

Noi Nithanam (prognosis):

As per siddha system four types of mega formed as a result of vathaneer is incurable. The six types arising due to the vitiation of pitham could be cured with great difficulty.

But then ten types of pramegam arising due of iyyam are curable by proper treatment.

Maruthuvam:

"வைத்திய செயல் வைத்தியமாமே
பலவாறு மாறுதலடைந்து கெடுக்கின்ற உடலை நிலைக்கும்படி
மாறுதல் அணுகாமலும் ஒரே தன்மையாக
செய்தும் அதனாலாஞ் செயிலக் குறைவின்றி
நடக்கச் செய்வது தெதுவோ அதுவே வைத்தியம்"

-திருமூலர் -800

In siddha system of medicine is not only for treat the disease, but also prevent the disease and improve the immunity. This is said as follows.

Kaapu	-	Prevention
Neekkam	-	Treatment
Niraivu	-	Restoration

Line of treatment:

The derangement of thridosha especially the pithathathu is the mainfactor for madhumegam. This happens especially during once pitha period of life that is 33 to 66years of life. So Vamanam was given to the patients before treatments.

1.வசம்பு குடிநீர் - 30ml (காலையில் 2 அல்லது 3 முறை தர வாந்தியாகும்)
வாந்திநிற்காவிடில் கொத்தமல்லி குடிநீர் 30ml பருகவும்.

Then the first day trial medicines were given.

"வேர்பாரு தழைபாரு மிஞ்சினக்கால் மெல்ல மெல்ல
பற்ப செந்தூரம் பாரே"

-குணபாட தாதுசீவ வகுப்பு.

Hence the author tries the herbal preparation "Neerizhivu Chooranam" for antidiabetic activity.

Diet in siddha system:-

"உணவே மருந்து மருந்தே உணவு"

-திருமூலர்

"மருந்தென வேண்டாவாம் யாக்கைக் அருந்தியது
அற்றது போற்றி யுணின்"

- **திருக்குறள்**

Siddha system says a great importance on the observation of ruks regarding diet in everyday life because the siddha system has rightly realised that the basic factor of the body is food. That is Annamayakosam is the first among the five kosams constituting our physical and mental existence. To prevent the occurrence of the disease, elaborate inference regarding food item in our daily diet is given in the text book of siddha.

Principles of Diet therapy:

Diet should be balanced:

It should have 10-15% calories from proteins, 20-25% calories from fats and rest of 60-65% from complex carbohydrates with adequate vitamins and minerals.

Quantity of the diet:

For under weight and normal weight diabetic there need not any restriction on calories. For an overweight diabetic, reduction in the number of calories is essential. Total Calories should be approximately 30cal/kg of body weight + extra allowance of physical activity.

Simple sugar need to be avoided:

Simple sugars like cane sugar, glucose, sweets, soft drinks, cakes, ice creams should be avoided in day diet as they are rapidly absorbed and cause sudden rise in the blood glucose.

Fibre in plenty:

Diet should be rich in fibre, approximately 20-30gm / day. Grain foods should be consumed with their natural fibrous coating eg. whole wheat flour instead of refined brown bread instead of white fruits with peals, instead of fruit juices have been widely recommended for diabetics because of its fibre content.

Fats:

Total intake of fats should not exceed 25% of calories. Animal fats (Saturated) ingestion should be limited.

Fats and cooking oils:-

Fats and oils are essential components of human diet 20-25% of the total calories should come from them. In a 2000 calories diet, this amount to 40-50gm oil per day.

Poly unsaturated fats are less atherogenic than monounsaturated and saturated fats. Daily cholesterol intake in diet should be less than 250 mg.

Essential fatty acids play an imporatant role in lipid physiology and protect against atheroscelerosis by lowering cholesterol levels and regulates the clotting mechanisms and maintaining the stability of vascular endothelial cells.

உணவு முறைகள்:-

தாராளமாக சேர்க்கவேண்டிய உணவுகள்:

கீரைகள்	காரட்
கோதுமை	காளான்
அவரை	சூப்வகைகள்
கொத்தவரை	நார்சத்துள்ள உணவுகள்
பாகல்	நாவற்பழம்
புடலை	முட்டைகோஸ்

தவிர்க்கப்படவேண்டியவை:

- கிழங்கு வகைகள்
- இனிப்பு வகைகள்
- வெண்ணெய், நெய்
- பொரித்த உணவுகள்
- ஆட்டிறைச்சி, மாட்டுஇறைச்சி
- இறால், நண்டு
- முட்டை மஞ்சள் கரு

- வாழைப்பழம்
- உலர்ந்த பழவகைகள்
- கொட்டைப் பருப்பு
- மதுபானங்கள்

Exercise:

Burn calories to earn them. From a medical point of view such activities are most welcome as there is no doubt about the importance of exercise in promoting physical and mental health and perhaps even in preventing and helping to care disease.

During exercise, whole body oxygen consumption may increase by as much as 20 fold and even greater increase may occur in the working muscles.

To meet its energy needs under these circumstances, Skeletal muscle uses, at a greatly increased rate its own stores of glycogen and triglycerides, as well as free fatty acids derived from break down of adipose tissues, triglycerides and glucose released from liver.

The presence of high levels of insulin, due to exogenous insulin administration, can attenuate or even prevent the increased mobilization of glucose and other subtrates induced by exercise and hypoglycaemia may ensure.

Indeed, in patients with type 2 diabetes exercise may improve insulin sensitivity and assist in diminishing elevated blood glucose levels in to the normal ranges.

Yogasana treatment for madhumegam :

According to Thirumanthiramn Yoga is the attainment of spiritual, psychological and physical perfection. As the body is said to be the abode of divinity. Thirumoolar has advised each and every individual aspiring for self realisation should practice yogasanam. It is a science that helps to

lead a pure and healthy life. The practice of yoga lessens and prevents the decay of issues by increasing with abundant energy.

Aasanaas are nothing but a kind of yogic exercises. There are innumerable types of Aasanaas.

According to Thirumoolar, each yogasanam is indicated for a definite effect in a particular region of the system by stimulating the internal organs to function in a normal way and to co-ordinate bodily functions.

The following aasanaas are advised for controlling madhu megam

- Padmaasanam
- Mayuraasanam
- Chakkaraasanam
- Pachimothaasanam
- Vilaasanam
- Mathsyaasanam
- Pujangaasanam
- Sarvaangaasanam

All these aasanas should be practiced daily and regularly which can be of immense value to patients of madhumegam. All these aasanaas activate the pancreatic cells and have a curative value. These helps in retiring cellular function of the pancreas and activate them to work more.

Out of these aasanas “Vilaasanam” and “Mayuraasanam” are specifically helps in the treatment of madhumegam.

REVIEW OF LITERATURES

MODERN ASPECT

DIABETES MELLITUS

Definition:

Diabetes mellitus is a clinical syndrome characterized by hyperglycaemia due to absolute or relative deficiency of insulin.

Lack of insulin affects the metabolism of carbohydrate ,protein and fat and causes a singnificant disturbance of water and electrolyte homeostasis.

Epidemiology:

Diabetes is worldwide in distribution and the incidence of both type 1 and type 2 diabetes is rising day by day. It is estimated that, in the year 2000, 150 million people worldwide had diabetes, and this is expected to increasing double the amount by the year 2010. It is associated with several contributory factors including increased longevity, obesity, unsatisfactory diet, sedentary lifestyle and increasing urbanization.

However, the prevalence of both types of diabetes varies considerably around the world, and is related to differences in genetic and environmental factors. A pronounced rise in prevalence occurs in migrant populations to industrialized countries, e.g. Asian and Afro-Carribbean immigrants to the United Kingdom.Many more cases of type 2 diabetes remain undetected.

DM is expected to continue as a major health problem, because of its serious complications, especially renal disease, ischemic heart disease, gangrene of the lower extremities and blindness in the adults.

Anatomy of the pancreas:

Pancreas is a retro-peritoneal, fleshy organ, has both endo and exocrine function. It is supra-umbilical, intrahepatic, posterio-abdominal, retroperitoneal organ, crossing the mid-line from right to the left. As it's retroperitoneal, the organ does not move with respiration.

Generally, it has head, neck, body and tail. The head of the pancreas is within the concavity of the deodenum. The neck crosses the portal vein. The body crosses the great vessels of the abdomen like, inferior vena cava, aorta, and left renal blood vessels. The tail of the pancreas is in the left hypochondrium and, it contacts the hilum of the spleen. The superior border is related to spleenic artery. The anterior border gives attachment to transverse mesocolon.

Histophysiologically, this is a compound tubular gland showing endo and exocrine functions of which are correlated with pituitary gland.

Microscopic anatomy of islets of – langerhans:

They are found more in the tail of the pancreas than in the other parts. They form about 1 – 2% of pancreatic weight. The histological structure of the islets shows Alpha, Beta and Delta cells, of which,

- Alpha cells form 20% and glucagon secreting
- Beta cells form about 75% and insulin secreting
- Delta cells form about 5% and gastrin secreting.

Beta cells are the source of insulin hormone. The cells are polyhydral, the nuclei are centrally or eccentrically placed, the cytoplasm is grannular, filled with prominent secretary vacuoles containing few ribosomes. The secretory granules show species variations. In man they are spherical or elongated crystalline body.

Insulin Biosynthesis, Secretion, and Action:

Biosynthesis:

Insulin is produced in the beta cells of the pancreatic islets. It is initially synthesized as a single-chain 86-amino-acid precursor polypeptide, namely preproinsulin. By the action of proteolysis the aminoterminal single peptide is removed and giving rise to proinsulin. Proinsulin is structurally related to insulin-like growth factors I and II, which bind weakly to the insulin receptor. Cleavage of an internal 31-residue fragment from proinsulin generates the C peptide and the A (21 amino acids) and B (30 amino acids) chains of insulin, which are connected by disulphide bonds.

The mature insulin molecule and C peptide are stored together and cosecreted from secretory granules in the beta cells. Because the C peptide is less susceptible than insulin to hepatic degradation, it is a useful marker of insulin secretion and allows discrimination of endogenous and exogenous sources of insulin in the evaluation of hypoglycemia.

Secretion:

Glucose is the key regulator of insulin secretion by the pancreatic beta cell, although amino acids, ketones, various nutrients, gastrointestinal peptides, and neurotransmitters also influence the insulin secretion. Glucose levels >3.9 mmol/L (70 mg/dL) stimulate insulin synthesis, primarily by enhancing protein translation and processing, as well as inducing insulin secretion. Glucose stimulates insulin secretion through a series of regulatory steps that begin with transport into the beta cell by the GLUT2 glucose transporter. Glucose phosphorylation by glucokinase is the rate-limiting step that controls glucose-regulated insulin secretion.

Metabolic Actions of Insulin:

Anabolic actions:

a. Carbohydrate metabolism:

Insulin increases the glucose transport (muscle, adipose tissue), phosphorylation, glycogenesis , glycolysis, pyruvate dehydrogenase activity and pentose phosphate shunt.

b. Lipid metabolism:

Insulin increases the triglyceride synthesis , fatty acid synthesis (liver) and lipoprotein lipase activity (adipose tissue).

c. Protein metabolism:

Insulin increases the amino acid transport and protein synthesis.

Anticatabolic actions:

a. Carbohydrate metabolism:

Insulin decreases the gluconeogenesis and glycogenolysis.

b. Lipid metabolism:

Insulin decreases the lipolysis, ketogenesis and fatty acid oxidation (liver).

c. Protein metabolism:

Insulin decreases protein degradation.

Normal Blood Sugar Level:

In normal persons, blood glucose level is controlled within a narrow range. After the overnight fasting, in early morning, the blood glucose level ranges between 80 and 90 mg/dl of blood. Between first and second hour after meals (post prandial), the blood glucose level raises to 120-140 mg/dl. The glucose level in the blood is brought back to normal at the end of second hour after the meals.

Necessity Of Regulation Of Blood Glucose Level:

Regulation of blood glucose level is very essential because, glucose is the only nutrient that can be utilized by tissues of brain, retina and germinal epithelium of the gonads.

Role Of Liver In The Maintenance Of Blood Sugar Level:

Liver acts as an important glucose buffer system. When blood glucose level increases after a meal, the excess glucose is converted into glycogen and stored in liver. When the blood glucose level falls, from the normal range the liver glycogen is converted into glucose and released into the blood from the liver cells.

Role of Insulin In The Maintenance Of Blood Sugar Level:

Insulin is the only antidiabetic hormone, as it reduces blood sugar level. It reduces the blood sugar level by the following actions.

1. Transport and uptake of Glucose:

When a food with excess amount of carbohydrate is taken, the blood sugar level is increased. Immediately, pancreas secretes insulin. The insulin facilitates the transport of glucose from the blood into the cells by increasing the permeability of cell membrane to glucose.

Insulin enhances the uptake of glucose by all the tissues particularly by liver, muscle and adipose tissues. However, insulin is not required for glucose uptake in some tissues like brain (except hypothalamus), renal tubules, mucus membrane of intestine and red blood cells.

2. Peripheral utilization of Glucose:

The glucose entering the cells is oxidized by most of the cells immediately. The rate of utilization depends upon intake of glucose, and the glucose utilization is enhanced by insulin.

3. Storage of Glucose:

Insulin promotes the rapid conversion of glucose into glycogen (glycogenesis) in muscle and liver. Thus, glucose is stored in these two organs in the form of glycogen. The insulin causes conversion of glucose into fatty acids.

4. Inhibition of Glycogenolysis:

Insulin prevents the breakdown of glycogen into glucose in muscles and liver.

5. Inhibition of Gluconeogenesis:

Insulin prevents gluconeogenesis i.e., it prevents the formation of glucose from proteins by following ways:

a) Inhibiting the release of amino acids from muscle and

b) Inhibiting the activities of enzymes involved in gluconeogenesis.

Thus insulin decreases the blood sugar level in following manner:

- Facilitating the transport and uptake of glucose by the cells.
- Increasing the peripheral utilization of glucose.
- Conversion of glucose into glycogen in liver and muscle.
- Prevention of glycogenolysis.
- Inhibition of gluconeogenesis.

Role Of Glucagon In The Maintenance Of Blood Sugar Level

1. Glucagon increases glycogenolysis (breakdown of glycogen into glucose) in liver. And, the glucose thus formed is released from the liver cells into the blood. Glucagon does not induce glycogenolysis in muscle.
2. Glucagon increases gluconeogenesis (formation of glucose from proteins) in liver.

Role Of Other Hormones In The Maintenance Of Blood Sugar Level

I.Growth Hormone

Growth hormone increases the blood sugar level by the following ways:

- ❖ Decrease in the peripheral utilization of glucose for the production of energy.
- ❖ Increase in the deposition of glycogen in the cells.
- ❖ Decrease in the uptake of glucose by the cells.
- ❖ Diabetogenic effect of growth hormone.

II.Cortisol

Cortisol increases the blood glucose level by acting on liver cells and the peripheral tissues. Following are the actions of cortisol on glucose metabolism.

a. It increases the gluconeogenesis in liver from amino acids. When the amino acids enter the liver, gluconeogenesis is accelerated.
b. It decreases the glucose (anti-insulin action) uptake by peripheral cells and the utilization of glucose.

III. Adrenaline

Adrenaline increases the blood glucose level by increasing glycogenolysis in liver and muscle. So, a large quantity of glucose enters the blood.

IV. Thyroxine

Thyroxine increases the blood sugar level by the following ways;

- ❖ It increases the absorption of glucose from gastrointestinal tract.
- ❖ It increases the breakdown of glycogen into glucose.
- ❖ It accelerates the process of gluconeogenesis.

Classification

Etiologic Classification of Diabetes Mellitus

I. Type 1 diabetes – 10% (β-cell destruction, usually leading to absolute insulin deficiency)

A. Immune-mediated

B. Idiopathic.

II. Type 2 diabetes – 80% (may range from predominantly insulin resistance with relative insulin deficiency to a predominantly insulin secretory defect with insulin resistance)

III. Other specific types of diabetes – 10%

A. Genetic defects of – β cell function characterized by mutations in various enzymes:

1. Hepatocyte nuclear transcription factor (HNF) 4 (MODY 1)
2. Glucokinase (MODY 2)
3. HNF – 1 (MODY- 3)
4. Insulin promoter factor (IPF) 1 (MODY 4)
5. HNF – 1 (MODY 5)
6. Mitochondrial DNA
7. Proinsulin or Insulin conversion.

B. Genetic defects in insulin action

C. Diseases of the exocrine pancreas-pancreatitis, neoplasia, cystic fibrosis, hemochromatosis, fibrocalculous pancreatopathy.

D. Endocrinopathies like acromegaly, Cushing's syndrome, pheochromocytoma, hyperthyroidism, aldosteronoma

E. Drug- or chemical-induced Vacor, pentamidine, nicotinic acid, glucocorticoids, thyroid hormone, diazoxide, adrenergic agonists,thiazides, phenytoin, interferon, protease inhibitors, clozapine, beta blockers.

F. Infections: congenital rubella, cytomegalovirus

G. Uncommon forms of immune-mediated diabetes: "stiff-man" syndrome, anti-insulin receptor antibodies

H. Other genetic syndromes sometimes associated with diabetes: Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Friedreich's ataxia, Huntington's chorea, Laurence-Moon-Biedl syndrome, myotonic dystrophy, porphyria, Prader-Willi syndrome

IV. Gestational diabetes mellitus (GDM):

Gestational diabetes, defined as hyperglycaemia diagnosed for the first time in pregnancy. About 4% pregnant women develop DM due to metabolic changes during pregnancy. Although they reverse back to normal glycaemia after delivery. These women are prone to develop DM later in their life.

TYPE 1 DIABETES
(INSULIN DEPENDENT DIABETES MELLITUS)

Pathogenesis

Genetic Considerations

The genetic contributions to type 1 DM involve multiple genes. The development of the disease appears to require inheritance of a sufficient complement of genes to confer susceptibility to the disorder.

The major susceptibility gene for type 1 DM is located in the HLA region on chromosome 6. Polymorphisms in the HLA complex appear to account for 40 to 50% of the genetic risk of developing type 1 DM.

Environmental Factors

It has been proposed that lack of exposure to pathogenic organisms in early childhood limits maturation of the immune system and increases susceptibility to autoimmune disease (‘the hygiene hypothesis’).

1 Viruses

2.Diet

3.Stress

4.Immunological factors

Viruses

The evidence that viral infection might cause some forms of type 1 diabetes is derived from studies where virus particles known to cause cytopathic or autoimmune damage to beta cells. The viruses have been isolated from the pancreas.

Virusus that causes type 1 diabetes include

Mumps,Coxsackie B4, retroviruses, rubella (in utero), cytomegalovirus and Epstein-Barr virus.

Diet:

Dietary factors may influence the development of type 1 diabetes. Bovine serum albumin (BSA), a major constituent of cow's milk, has been implicated in triggering type 1 diabetes. It has been shown that children who are given cow's milk early in infancy are more likely to develop type 1 diabetes than those who are breastfed. BSA may cross the neonatal gut and raise antibodies which, because of the close homology between BSA, the Beta chain of HLA class II antigens and a heat-shock protein expressed by beta cells, could cross-react with and cause damage to beta cell components. Various nitrosamines and coffee have been proposed as potentially diabetogenic factors.

Stress:

Stress may progress the development of type 1 diabetes by stimulating the secretion of counter-regulatory hormones and possibly by modulating immune activity.

Immunological Factors

Type 1 diabetes is a slow T cell-mediated autoimmune disease. Family studies have produced evidence that destruction of the insulin-secreting cells in the pancreatic islets takes place over many years. Hyperglycaemia accompanied by the classical symptoms of diabetes occurs only when 70-90% of beta cells have been destroyed.

TYPE 2 DM

(NON INSULIN DEPENDENT DIABETES MELLITUS)

Type 2 DM is a heterogeneous disorder with a complex etiology that develops in response to genetic and environmental influences. Central to the development of type 2 DM are insulin resistance and abnormal insulin secretion. Although controversy remains regarding the primary defect, most studies support the view that insulin resistance precedes insulin secretory defects.

Risk factors for Type 2 Diabetes Mellitus

1. Family history of diabetes (i.e., parent or sibling with type 2 diabetes)
2. Obesity (i.e., '>20% desired body weight or BMI> 27 kg/m2) Age > 45 years.
3. Race/ethnicity(e.g. African American, Hispanic American, Native American, Asian American, Pacific Islander)
4. Previously identified IFG or IGT.
5. History of GDM or delivery of baby over 9 Ibs.
6. Hypertension (blood pressure> 140/90 mmHg)
7. HDL cholesterol level<0.90 mmol/L (35 mg/dL) and/ or a triglyceride level>2.82 mmol/L(250 mg/dL)
8. Polycystic ovary syndrome.

Genetic Considerations

Type 2 DM has a strong genetic component. Although the major genes that predispose to this disorder have yet to be identified, it is clear that the disease is polygenic and multifactorial. Various genetic loci contribute to susceptibility, and environmental factors (such as nutrition and physical activity) further modulate phenotypic expression of the disease. The concordance of type 2 DM in identical twins is between 70

and 90%. Individuals with a parent with type 2 DM have an increased risk of diabetes; if both parents have type 2 DM, the risk in offspring may reach 40%. Insulin resistance, as demonstrated by reduced glucose utilization in skeletal muscle, is present in many nondiabetic, first-degree relatives of individuals with type 2 DM. However, definition of the genetic abnormalities of type 2 DM remains a challenge because the genetic defect in insulin secretion or action may not manifest itself unless an environmental event or another genetic defect, such as obesity, is superimposed.

Environmental Factors

- Lifestyle
- Malnutrition in utero
- Age
- Pregnancy

1. Life Style

Epidemiological studies of type 2 diabetes shows that overeating, especially when combined with obesity, middle-aged people with diabetes eat significantly more and are fatter and less active than their non-diabetic siblings. Obesity probably acts as a diabetogenic factor (through increasing resistance to the action of insulin) in those genetically predisposed to develop type 2 diabetes.

2. Malnutrition In Utero

Retrospective analysis of the birth weight of males born an inverse relationship between weight at birth and at 1 year, and the development of type 2 diabetes in late adulthood.

It is proposed (but not yet proven) that malnutrition in utero may programme beta cell development and metabolic functions at a critical period, so predisposing to type 2 diabetes later in life. Smoking during pregnancy has also been implicated.

3. Age

Age is an important risk factor for type 2 diabetes. Over 70% of all cases of diabetes occur after the age of 50 years. Type 2 diabetes is principally a disease of the middle aged and elderly, affecting 10% of the population over the age of 65.

4. Pregnancy

During normal pregnancy, insulin sensitivity is reduced through the action of placental hormones and this affects glucose tolerance. The term 'gestational diabetes' refers to hyperglycaemia occuring for the first time during pregnancy. Repeated pregnancy may increase the likelihood of developing irreversible diabetes, particularly in obese women; 80% of women with gestational diabetes ultimately develop permanent clinical diabetes requiring treatment.

Pathogenesis of type 2 diabetes

Insulin resistance

Increased hepatic production of glucose and resistance to the action of insulin in muscle are invariable in both obese and non-obese patients with type2 diabetes. Insulin resistance may be due to any one of three general causes: an abnormal insulin molecule, an excessive amount of circulating antagonists, or target tissue defects. The last is the most common cause of insulin resistance in type 2 diabetes and seems to be the predominant abnormality in those with more severe hyperglycaemia.

A characteristic feature of type 2 diabetes is that it is often associated with other medical disorders including obesity, hypertension and hyperlipidaemia. It has been suggested that this cluster of conditions, all of which predispose to cardiovascular disease, is a specific entity (the 'insulin resistance syndrome' or 'metabolic syndrome'), with insulin resistance being the primary defect.

The features of insulin resistance syndrome are Hyperinsulinaemia, type 2 DM or impaired glucose tolerance, hypertension, Low HDL cholesterol, Elevated triglycerides, central(visceral) obesity, microalbuminuria, increased fibrinogen, increased plasminogen activator inhibitor-1and elevated plasma uric acid.

Pancreatic beta cell failure

In type 2 diabetes there is only moderate reduction in the total mass of pancreatic islet tissue which is consistent with a measurable fall in plasma insulin concentration when related to the blood glucose level. However, some pathological changes are typical of type 2 diabetes, the most consistent of which is deposition of amyloid. This is accompanied by atrophy of the normal tissue, particularly islet epithelial cells. Islet amyloid is composed of insoluble fibrils formed from islet amyloid polypeptide (also known as amylin). Small quantities of islet amyloid are very common in elderly non-diabetic patients, and the role of islet amyloid in the pathogenesis of type 2 diabetes is uncertain. Deposition of amyloid is probably not a cause of diabetes but rather reflects a pathological process which is increased in type 2 diabetes.

MODY GENETICALLY DEFINED, MONOGENIC FORMS OF DIABETES MELLITUS

MODY comprises a phenotypically and genetically heterogeneous subtype of DM. Onset of the disease typically occurs between the ages of 10 and 25. Five different varities of MODY,

MODY1, MODY2, MODY3, MODY4, MODY5.

MODY2 the most common variant, is caused by mutations in the glucokinase gene. As a result of glucokinase mutations, higher glucose levels are required to elicit insulin secretory responses, thus altering the set point for insulin secretion.

GESTATIONAL DIABETES:

Gestational diabetes, defined as hyperglycaemia diagnosed for the first time in pregnancy, is a common problem. It occurs in individuals who have an inherited predisposition to develop diabetes and may take the form of either type I or type II diabetes. The hyperglycaemia may not disappear after delivery. It is associated not only with increased rates of perinatal mortality and neonatal morbidity but also with a high incidence (possibly as great as 80% at 25 years postpartum) of subsequent clinical diabetes (both type I and type II) in the mother. Normalisation of metabolism, whether by treatment with dietary measures alone or, more commonly, with additional treatment in the form of insulin, undoubtedly reduces the fetal risk; its effect on diminishing the maternal risk of subsequent diabetes is less certain.

The clinical features of the two main types of diabetes are compared below. Comparative Clinical Features of Type 1 And Type 2 Diabetes

The classical symptoms of thirst, polyuria, nocturia and rapid weight loss are prominent in type 1 diabetes, many of whom are asymptomatic or have non-specific complaints such as chronic fatigue and malaise.

Uncontrolled diabetes is associated with an increased suspectibility to infection and patients may present with skin sepsis(boils) and genital candidiasis and complain of pruritus vulvae and balanitis.

Patients with type 1 diabetes often have no physical signs attributable to diabetes, but weight loss is common. The physical signs in patients with type 2 diabetes at diagnosis depend on the mode of presentation. More than 70% are overweight, and obesity may be central(truncal or abdominal). Obesity is less common in developing countries.

Hypertension is present in 50% of patients with type 2 diabetes. Although hyperlipidaemia is also common, skin lesions such as xanthelasma and eruptive xanthomata are relatively rare.

MAJOR MANIFESTATIONS OF DISEASE

Hyper Glycaemia:

Hyperglycaemia is a very common biochemical abnormality. It is frequently detected on routine biochemical analysis of asymptomatic patients, and is found during conditions which impose a burden on pancreatic beta cells, such as pregnancy, severe illness or treatment with drugs such as corticosteriods('stress hyperglycaemia').

Pathogenesis:

Depending upon etiology of DM, hyperglycaemia may result from:

Reduced insulin secretion;

Decreased glucose use by the body; and

Increased glucose production.

Symptoms Of Hyperglycaemia Associated With Diabetes

- Thirst, dry mouth.
- Poly uria.
- Nocturia.
- Tiredness, fatigue, irritability.
- Recent change in weight.
- Blurred vision.
- Pruritus vulvae, balanitis(genital condidiasis)
- Nausea; headache, hyperphagia; predilection for sweet foods.

Diabetic Ketoacidosis:

Keto acidosis is caused by insulin deficiency and an increase in catabolic hormones, leading to hepatic over-production of glucose and ketone bodies.

The cardinal biochemical features of diabetic ketoacidosis are:

- Hyperglycaemia
- Hyperketonaemia
- Metabolic acidosis

Investigations:

The following are important but should not delay the institution of intravenous fluid and insulin replacement:

- Urea and electrolytes,
- blood glucose
- Arterial blood gases to assess the severity of acidosis
- Urine analysis for ketones
- Full blood count
- Infection screen: blood and urine culture, chest radiograph.

Hypoglycaemia

Hypoglycaemia (i.e. a blood glucose<3.5 mmol/l) is a result of the treatment of diabetes rather than a manifestation of the disease itself. It occurs often in those taking a sulphonylurea drug. Most patients recognize the symptoms of hypoglycaemia and can take appropriate remedial action; others are less aware of these and, if action is not taken, neuroglycopenia and reduced consciousness ensue.

Causes of Hypoglycaemia:

Errors in oral hypoglycaemic agent or insulin dose/ schedule/ administration Poorly designed insulin regimen, particularly if predisposing to nocturnal hyperinsulinaemia.

- Missed, delayed or inadequate meal
- Unexpected or unusual exercise
- Alcohol
- Lipohypertrophy
- Gastroparesis due to autonomic neuropathy

- Malabsorption, e.g. celiac disease
- Unrecognised other endocrine disorder, e.g. Addison's disease

Common Symptoms of Hypoglycaemia

a. Autonomic

The common autonomic symptoms of hypoglycaemia are sweating, trembling, hunger, pounding heart, and anxiety.

b. Neuroglycopenic

The common neuroglycopenic symptoms of hypoglycaemia are confusion, drowsiness, speech difficulty , inability to concentrate and incordination.

c. Non-Specific

The common non-specific symptoms of hypoglycaemia are nausea, tiredness and headache.

DIAGNOSIS

Revised criteria for diagnosing DM have been issued by consensus panels of experts from the National Diabetes Data Group and the World Health Organization

Criteria for the Diagnosis of Diabetes Mellitus

The revised criteria for the diagnosis of DM emphasize the FPG (fasting plasma glucose) as the most reliable and convenient test for diagnosing DM in asymptomatic individuals. A random plasma glucose concentration >11.1 mmol/L (200 mg/dL) accompanied by classic symptoms of DM (polyuria, polydipsia, weight loss) is sufficient for the diagnosis of DM. Oral glucose tolerance testing, although still a valid mechanism for diagnosing DM, is not recommended as part of routine screening.

Glycated Haemoglobin: HBA1C

Glycated haemoglobin provides an accurate and objective measure of glycaemic control over a period of weeks to months. This can

be utilized as an assessment of glycaemic control in a patient with known diabetes, but is not sufficiently sensitive to make a diagnosis of diabetes and is usually normal in patients with impaired glucose tolerance.

Urine testing

a. Glucose

Testing the urine for glucose is the usual procedure for detecting diabetes, using sensitive glucose-specific dipstick methods. If possible, testing should be performed on urine passed 1-2hours after a meal since this will detect more cases of diabetes than a fasting specimen. Glycosuria always warrants full assessment.

The greatest disadvantage of using urinary glucose as a diagnostic or screening procedure is the individual variation in renal threshold. Apart from diabetes, the most common cause of glycosuria is a low renal threshold for glucose, which is common during pregnancy and in young people, and is a more frequent cause of glycosuria than diabetes.

b.Ketones

c.Protein

d.Blood Lipids

LABORATORY EVALUATION

If the patient is a known diabetic, the following tests are to be advised

- Fasting blood sugar (FBS)
- Postprandial blood sugar (PPBS)
- Glycated haemoglobin (HbA1c)
- Blood urea
- Serum creatinine
- Urine protein
- Haemogram
- Complete Urine Examination
- Lipids (total cholesterol, triglycerides, HDL, LDL)
- Liver function tests (LFT)

If the patient is not a known diabetic, the following tests can be advised

- Glucose tolerance test (GTT)
- Glycated haemoglobin (HbA1c)
- Blood urea
- Serum creatinine
- Urine P/C ratio
- Complete urine examination
- Lipids (total cholesterol, triglycerides, HDL, LDL)
- Liver function tests (LFT)
- ECG

COMPLICATIONS:

COMPLICATIONS OF DIABETES MELLITUS

1. Acute Complications

- Diabetic ketoacidosis (DKA)
- Nonketotic hyperosmolar state(NKHS)

- Hyper osmolar coma hypoglycemia

CHRONIC COMPLICATIONS

Chronic Complications of diabetes are due to Vascular damage from persistent hyperglycemia. Vascular damage leads to end-organ damage. Other conditions associated with diabetes, such as hypertension, dyslipidemia (as well as smoking) accelerate the development of vascular damage and the chronic complications of diabetes, which are the following:

Diabetic Ketoacidosis:

Diabetic ketoacidosis is a major medical emergency and remains a serious cause of morbidity, principally in people with type 1 diabetes. The average mortality in developed countries is 5-10% and is higher in the elderly.

A clear understanding of the biochemical basis and pathophysiology of this problem is essential for its efficient treatment.

Ketoacidosis is caused by insulin deficiency and an increase in catabolic hormones, leading to hepatic over-production of glucose and ketone bodies.

The cardinal biochemical features of diabetic ketoacidosis are:

- hyperglycaemia
- hyperketonaemia
- metabolic acidosis.

Hyperglycaemia causes a profound osmotic diuresis leading to dehydration and electrolyte loss, particularly of sodium and potassium. The metabolic acidosis forces hydrogen ions into cells, displacing potassium ions, which may be lost in urine or through vomiting.

About half the deficit of total body water is derived from the intracellular compartment and occurs comparatively early in the

development of acidosis with relatively few clinical features; the remainder represents loss of extra cellular fluid sustained largely in the later stages. It is at this time that marked contraction of the size of the extra cellular space occurs, with haemo concentration, a decreased blood volume, and finally a fall in blood pressure with associated renal ischaemia and oliguria.

Every patient in diabetic ketoacidosis is potassium-depleted, but the plasma concentration of potassium gives very little indication of the total body deficit. Plasma potassium may even be raised initially due to disproportionate loss of water and catabolism of protein and glycogen.

However, soon after insulin treatment is started there is likely to be precipitous fall in the plasma potassium due to dilution of extra cellular potassium byadministration of intravenous fluids, the movement of potassium into cells as a result of treatment with insulin, and the continuing renal loss of potassium.

The severity of ketoacidosis can be assessed rapidly by measuring the plasma bicarbonate; less than 12 mmol/l indicates severe acidosis.

Clinical features:

Symptoms : Nausea, vomiting Thirst, polyuria, Abdominal pain, Altered mental function and Shortness of breath

Physical findings : Tachycardia, Dry mucous membranes, reduced skin turgor, Dehydration, hypotension, Tachypnea, Kussmaul respirations, respiratory distress, Abdominal tenderness, (may resemble acute pancreatitis or surgical abdomen) FeverLethargy, cerebral edema and possibly coma.

Precipitating events Inadequate insulin administration, infection (pneumonia/UTI/gastroenteritis/sepsis), Infarction (cerebral, coronary, mesenteric, peripheral) and drugs (cocaine)

Nonketotic Hyperosmolar State

Clinical Features: NKHS is most commonly seen in elderly individuals with type 2 DM. Its most prominent features include polyuria; orthostatic hypotension; and a variety of neurologic symptoms that include altered mental status, lethargy, obtundation, seizure, and possibly coma.

The prototypical patient is a mildly diabetic, elderly individual with a several week history of polyuria, weight loss, and diminished oral intake that culminates in mental confusion, lethargy, or coma. The physical examination reflects profound dehydration and hyperosmolality and reveals hypotension, tachycardia, and altered mental status.

NKHS is often precipitated by a serious, concurrent illness such as myocardial infarction or stroke. Sepsis, pneumonia, and other serious infections are frequent precipitants and should be sought thoroughly. In addition, a debilitating condition (prior stroke or dementia) or social situation that compromises water intake may contribute to the development of the disorder. Finally, the development of NKHS can be associated with the use of certain medications (thiazide diuretics, glucocorticoids, phenytoin).

2. Chronic Complications of Diabetes Mellitus

a. Microvascular:

- Eye disease
- Retinopathy(nonproliferative/proliferative) Macular edema
- Cataracts
- Glaucoma
- Sensory and motor neuropathy (mono- and polyneuropathy)
- Autonomic Nephropathy.

b. Macrovascular:

- Coronary artery disease
- Peripheral vascular disease
- Cerebrovascular disease

c. Other:

- Gastrointestinal (gastroparesis, diarrhoea)
- Genito urinary (uropathy/sexual dysfunction) Dermatologic

DIABETIC RETINOPATHY

Diabetic retinopathy is the most common cause of blindness in adults between 30 and 65 years of age in developed countries.

Pathogenesis:

Hyperglycaemia increases retinal blood flow and metabolism and has direct effects on retinal endothelial cells and pericytes, loss of which impairs vascular autoregulation. This results uncontrolled blood flow increases production of vasoactive substances and endothelial cell proliferation, resulting in capillary closure. This causes chronic retinal hypoxia and stimulated production of growth factors, including vascular endothelial growth factor (VEGF). VEGF acts via proteinkinase C to stimulate endothelial cell growth (causing new vessel formation) and increased vascular permeability (causing exudative damage).

Clinical Features Of Diabetic Retinopathy:

- Microaneurysms
- Retinal haemorrhages
- Exudates
- Cotton wool spots
- Venous changes
- Neovascularisation
- Pre-retinal haemorrhage
- Vitreous haemorrhage

- Fibrosis

INTRARETINAL MICROVASCULAR ABNORMALITIES

Intraretinal microvascular abnormalities (IRMA) are dilated, tortuous capillaries which represent the remaining patent capillaries in an area where most have been occluded.

Neovascularisation:

This may arise from the venous circulation on the optic disc or the retina in response to areas of ischaemic retina. retinal detachment can occur due to contraction of adhesions between the vitreous and the retina.

Venous Changes:

These include venous dilatation (an early feature probably representing increased blood flow), 'beading' (sausage-like changes in calibre) and increased tortuosity including 'oxbow lakes' or loops.

These latter changes indicate widespread capillary non-perfusion and are a feature of advanced pre-proliferative retinopathy.

Cataract:

Cataract is a permanent lens opacity and is the most common cause of visual deterioration in the elderly population.

The lens thickens and opacifies with age, and the increased metabolic insult to the lens in people with diabetes causes these changes to accelerate and occur prematurely. Very rarely, a type of cataract specific to diabetes occurs in young patients with poorly controlled diabetes, called a 'snow-flake' cataract. This does not usually affect vision but tens to make fundal examination difficult.

Renal Complications of Diabetes Mellitus:

The nephropathy that develops in type 2 DM differs from that of type 1 DM in the following respects

- microalbuminuria or over nephropathy may be present when type 2 DM is diagnosed, reflecting its long asymptomatic period;
- hypertension more commonly accompanies microalbuminuria or

overt nephropathy in type 2 DM; and

- microalbuminuria may be less predictive of progression to overt nephropathy in type 2 DM. Finally, it should be noted that albuminuria in type 2 DM may be secondary to factors unrelated to DM, such as hypertension, congestive heart failure, prostate disease, or infection.

Other renal problems may also occur in individuals with DM. Type IV renal tubular acidosis (hyporeninemic hypoaldosteronism) occurs in many individuals with DM.

NEUROPATHY AND DIABETES MELLITUS

Diabetic neuropathy occurs in approximately 50% of individuals with long-standing type 1 and type 2 DM. It may manifest as polyneuropathy, mononeuropathy, and/or autonomic neuropathy.

a. Polyneuropathy/Mononeuropathy:

The most common form of diabetic neuropathy is distal symmetric polyneuropathy. It most frequently presents with distal sensory loss. Hyperesthesia, parathesia, and pain also occur. Any combination of these symptoms may develop as neuropathy progresses. Physical examination reveals sensory loss, loss of ankle reflexes, and abnormal position sense.

b. Diabetic polyradiculopathy

c.Mononeuropathy (dysfunction of isolated cranial or peripheral nerves)

d. Autonomic Neuropathy

Cardiovascular Morbidity and Mortality:

Cardiovascular disease is increased in individuals with type 1 or type 2 DM. The Framingham Heart Study revealed a marked increase in several cardiovascular diseases in DM including peripheral vascular disease, congestive heart failure, coronary artery disease, myocardial infarction, and sudden death (risk increase from one- to fivefold).

The extremely high frequency of underlying cardiovascular disease in individuals with diabetes (especially in type 2 DM).The absence of chest pain (“silent ischemia”) is common in individuals with diabetes.

Hypertension:

Hypertension can accelerate other complications of DM, particularly cardiovascular disease and nephropathy. Hypertension therapy should first emphasize life-style modifications such as weight loss, exercise, stress management, and sodium restriction.

CLINICAL FEATURES OF THE DIABETIC FOOT Symptoms

Neuropathy	**Ischaemia**
None	None
Paresthesia	Claudication
Pain	Rest pain
Numbness	
Structural Damage	**Ischaemia**
Ulcer	Ulcer
Sepsis	Sepsis
Abscess	Gangrene
Osteomyelitis	
Digital gangrene	
Charcot joint	

Management Of Diabetic Foot Ulcers:

Remove callus skin, treat infection, avoid weight-bearing, ensure good diabetic control, control oedema, undertake angiogram to assess feasibility of vascular reconstruction where indicated.

Infections:

Individuals with DM exhibit a greater frequency and severity of infection. The reasons for this increase include incompletely defined abnormalities in cell-mediated immunity and phagocytic function associated with hyperglycemia, as well as diminished vascularization secondary to long-standing diabetes. Hyperglycemia likely aids the colonization and growth of a variety of organisms (Candida and other fungal species).

Pneumonia, urinary tract infections, skin and soft tissue infections are all more common in the diabetic population.

Dermatologic Manifestations

The most common skin manifestations of DM are protracted wound healing and skin ulcerations.

Diabetic dermopathy, sometimes termed pigmented pretibial papules, or "diabetic skin spots," begins as an erythematous area and evolves into an area of circular hyperpigmentation . These lesions result from minor mechanical trauma in the pretibial region and are more common in elderly men with DM.

Acanthosis nigricans (hyperpigmented velvety plaques seen on the neck or extensor surfaces) is sometimes a feature of severe insulin resistance and accompanying diabetes. Generalized or localized granuloma annulare (erythematous plaques on the extremities or trunk) and scleroderma (areas of skin thickening on the back or neck at the site of previous superficial infections) are more common in the diabetic population. Lipoatrophy and lipohypertrophy can occur at insulin injection sites but are unusual with the use of human insulin. Xerosis and pruritis are common and are relieved by skin moisturizers.

CLINICAL EXAMINATION OF THE PATIENT WITH DIABETES:

1. Examination Of The Hands:

Limited joint mobility (sometimes called cheirorthropathy) may be present; this is the inability to extend (to 180) the metacarpophalangeal or interphalangeal joints of at least one finger bilaterally. The effect can be demonstrated in the **prayers sign**. It causes painless stiffness in the hands, and occasionally affects the wrists and shoulders.

Dupuytren's contracture is common in diabetes and may include nodules or thickening of the skin and knuckle pads.

Carpal tunnel syndrome is common in diabetes and presents with wrist pain radiating into the hand.

Trigger finger (flexor tenosynovitis) may be present in people with diabetes.

Muscle-wasting/sensory changes may be present as features of a peripheral sensorimotor neuropathy, although this is more common in the lower limbs.

2. Abdomen	Hepatomegaly
3.Blood Pressure	
4.Axilla	Acanthosis nigricans
5.Neek	Carotid puses, Bruits and thyroid Enlargement.
6.Head	Xanthelasma, Cranial nerve palsy and eye movements/ ptosis

7. Examination of the Eyes:

- Visual acuity
- Distance vision using Snellen's chart at 6 meters.
- Near vision using standard reading chart.

Impaired visual acuity may indicate the presence of diabetic eye disease, and serial decline may suggest development or progression in severity. Lens opacification, look for the red reflex using the ophthalmoscope held 30 cm from the eye.

The presence of lens opacities or cataract should be noted.

Fundal examination:

The pupils must be dilated with a mydriatic and examined in a darkened room.Features of diabetic retinopathy should be noted, including evidence of previous laser treatment which leaves photocoagulation scars.

8.Legs :

- Muscle-wasting
- Sensory abnormality
- Granuloma annulare
- Hair loss
- Tendon reflexes
- Necrobiosis lipoidica

Neuropathic foot ulcer

9.Examination of The Feet

Inspection:

Look for evidence of callus formation on weight-bearing areas, clawing of the toes (a feature of neuropathy, loss of the plantar arch, discolouration of the skin,ischaemia), localised infection and the presence of ulcers.

Deformity of the feet may be present, especially in charcot neuroarthropathy.Fungal infection may affect skin between toes, and nails.

Circulation:

Peripheral pulses, skin temperature and capillary refill should be tested.

Sensation:

- Light touch : use monofilaments.
- Vibration sense: use 128Hz tuning fork over big toe/malleoli.

Pin-prick: Use pin

- Pain : pressure over Achilles tendon. Proprioception test
- Position of big toe
- Test for distal anaesthesia/hyperaesthesia in stocking distribution.

Reflexes: Test plantar and ankle reflexes.

DIETARY MANAGEMENT:

Aims Of Dietary Management:

- Abolish symptoms of hyperglycaemia
- Reduce overall blood glucose and minimise fluctuations
- Achieve weight reduction in obese patients to reduce insulin resistance, hyperglycaemia and dyslipidaemia
- Avoid hypoglycaemia associated with therapeutic agents (insulin,sulphonylureas).
- Avoid weight gain associated with therapeutic agents (insulin,sulphonylureas, thiazolidinediones).
- Avoid 'atherogenic' diets or those which may aggravate diabetic complications (e.g. high protein intake in nephropathy)

General Principles of Diet for Diabetes:

Direct sugar intake in the form of refined carbohydrates should be totally avoided. This includes table sugar, sweets, and jaggery. The total quantity of food must be restricted.

There is no need to change over from rice to wheat or ragi as the carbohydrate content of these different cereals is not significantly different. Green leafy vegetables and other low calorie foods can be taken in unlimited quantities.

Addition of vegetable proteins in the form of bengal gram, green gram, have multiple benefits as they:

- Increase the protein content
- Increase the fibre content
- Help to flatten sudden urges of blood sugar after a meal
- Help to reduce serum lipid (fat) levels
- The diet should help to maintain ideal body weight.
- The diet should also help bring down the cholesterol triglyceride levels

Types of Diabetic Diet

The basis for types of diet used in the treatment of diabetes;

- Low energy, weight-reducing diets
- Weight maintenance diets
- Diets for insulin-treated diabetes

Low-energy, weight-reducing diets

Dietary prescriptions which cause a daily deficit of 500 kcal provide a realistic diet and induce a weekly weight loss of around 0.5 kg. Rapid weight reduction may provoke loss of lean body tissue, and care must be taken in the elderly to avoid the omission of essential nutrients, vitamins and minerals. Caloric restriction is essential for the obese diabetic patient treated with insulin and most oral agents, to try to minimise the weight gain which these can promote. In such individuals, the omission of snacks between meals is often necessary

Weight maintenance diets

These are necessary for individuals with a normal body mass index and ideally should be high in carbohydrate and low in fat, with particular attention being paid to the type of fat ingested.

Diets for Insulin-treated Diabetes

A regular pattern of meals (and snacks) is important to maintain a constant daily intake of carbohydrate, and protects against hypoglycaemia. Simple information on the relative carbohydrate content of foods can be provided where ever appropriate. Carbohydrate exchanges (10 g portions) are currently not advocated as a method of controlling carbohydrate intake, as the exchange system makes no allowance for the glycaemic effect or for the fat content of foods. However, a good working knowledge of the carbohydrate content of foods is essential for practical management. An insufficient dose of insulin for a meal with a large carbohydrate content leads to post-

prandial hyperglycaemia, while inadequate carbohydrate consumption risks hypoglycaemia.

Diabetic Foods And Sweeteners:

Low-calorie and sugar-free drinks are useful for patients with diabetes. These drinks usually contain non-nutritive sweeteners. Many 'diabetic foods' contain sorbitol or fructose which are relatively high in energy, may be expensive and may have gastrointestinal side-effects. They are not recommended as part of the diabetic diet.

The non-nutritive sweeteners saccharin, aspartame, sucramate and acesulphame K are the most widely used and provide means for reducing energy intake without loss of palatability.

Of Energy Derived From Carbohydrate, Protein And Fat

	UK national diet	**Recommended diabetic diet**
Energy	Maintain BMI of 25 kg/m2	To approach BMI of22 kg/m2
Carbohydrate	45 %	50 - 55%
Fat	40%	30-35%
Saturated fatty acids	17%	<10%
Monounsaturated	11%	10-15%
Polyunsaturated	6%	<10%
Protein	12-15%	10-15%

BMI = body mass index (weight [kg]/ height2 [m2])

Education of The Patient About Dm And Exercise

Diabetes Education:

The diabetes educator is a health care professional (nurse, dietician, or pharmacist). The educator is a vital member of the comprehensive diabetes care program and educates the patient about a number of issues important for optimal diabetes care, including self-monitoring of blood

glucose; urine ketone monitoring (type 1 DM); insulin administration; guidelines for diabetes management during illnesses; management of hypoglycemia; foot and skin care; diabetes management before, during, and after exercise; and risk factor-modifying activities.

Exercise:

Exercise is an integral component of comprehensive diabetes care that can have multiple positive benefits (cardiovascular benefits, reduced blood pressure, maintenance of muscle mass, reduction in body fat, weight loss, etc.). For individuals with type 1 or type 2 DM, exercise is also useful for lowering plasma glucose (during and following exercise) and increasing insulin sensitivity.

Daily, regular physical exercise reduces insulin requirements. Sudden, unaccustomed violent exercise, however, it likely to precipitate hypoglycemia especially in patients on insulin and should be taken prophylactically. In the juvenile diabetic who has omitted insulin, vigorous exercise can however precipitate ketoacidosis. Skeletal muscle is a major site for metabolic fuel consumption in the resting state, the increased muscle activity during vigorous, aerobic exercise greatly increases fuel requirements. Individuals with type 1DM are prone to either hyperglycemia or hypoglycemia during exercise.

To avoid exercise - related hyper-or hypoglycemia, individuals with type 1DM should:

- Monitor blood glucose before, during, and after exercise.
- Eat a meal 1 to 3 hr before exercise and the supplemental
- carbohydrate feedings at least every 30min during vigorous or prolonged exercise;
- Decrease insulin doses(based on previous experience) before exercise and inject insulin into a non exercising area.
- Learn individual glucose responses to different types of exercise

and increase food intake for upto 24hr after exercises, depending on intensity and duration of exercise.

- In individuals with type 2DM, exercise-related hypoglycemia is less common but can occur in individuals taking either insulin or sulfonyl ureas.

ON GOING ASPECTS OF COMPREHENSIVE DIABETES CARE:

The morbidity and mortality of DM-related complications can be greatly reduced by timely and consistent surveillance procedures. Screening for dyslipidemia and hypertension should be performed annually.

An annual comprehensive eye examination should be performed by qualified optometrist or ophthalmologist.

Guidelines for Ongoing Medical Care for Patients with Diabetes:

- Self-monitoring of blood glucose (individualized frequency)
- HbA1c testing (2-4 times/year)
- Patient education in diabetes management (annual)
- Medical nutrition therapy and education (annual)
- Eye examination (annual)
- Foot examination (1-2 times/year by physician; daily by patient)

An annual foot examination should:

a. assess blood flow, sensation, and nail care;

b. look for the presence of foot deformities such as hammer or claw toes Charcot foot;

c. identify sites of potential ulceration

- Screening for diabetic nephropathy (annual)
- Blood pressure measurement (quarterly)
- Lipid profile (annual).

MATERIALS AND METHODS

PRECLINICAL AND PHASE – II RANDOMIZED OPEN CLINICAL STUDY ON MADHUMEGAM (TYPE 2 DIABETES MELLITUS) WITH NEERIZHIVU CHOORANAM

Study Design & Conduct of The Study:

Study type : Randomised clinical trial

Study place : OPD & IPD of PG Maruthuvam dept at Government Siddha Medical College & Hospital. Palayamkottai.

Study period : 12 months

Sample size: 40 patients

Population And Sample:

All NlDDM patients (fasting blood sugar ≥125 mg% and PP blood sugar ≥170 mg%) satisfying the inclusion and exclusion criteria mentioned below will be the population of study. NIDDM patients attending the OPD of PG Maruthvam department of Government Siddha Medical College Hospital, Palayamkottai, will be enrolled for this clinical research.

Sample size:

Sample size will be 40 patients. (20Op & 20 IP)

Treatment:

Medicine Name:	**NEERIZHIVU CHOORANAM**
Dose	2 gm; 2 times a day; after food;
Adjuvant	Butter milk
Duration	45 Days

Standard Operating Procedure For NEERIZHIVU CHOORANAM (Internal):

Source of Raw Drugs:

The source of raw drugs for preparation of NEERIZHIVU CHOORANAM are purchased from a well reputed country shop and raw drugs are purified & prepared in PG - gunapadam lab of Government Siddha Medical College, Palayamkottai.

Ingrdients of Neerizhivu Chooranam:

Aavari virai *(Cassia auriculala.linn)*
Thetran vithai *(Strychnous potatorum.linn)*
Kadukkai thol *(Terminalia chebula.linn)*
Vilam pisin *(Limonia acidissima.linn)*

} Equal

Method of purification:

Purification of thetran vidhai

'I'hctran vidhai is soaked in cows milk for 3 hours and is washed with plain water.

Purification of kadukkai thol:

Kadukkai seed is removed and soaked in lime juice and dried in sunlight.

Purification of vilampisin:

Vilampisin is clean well by removing the debris which adhere with it.

Method Of Purification of Neerizhivu Chooranam:

Ingredients:

Aavarai vithai chooranam (cassia auriculata)
Vilam pisin chooranam *(Limonia acidissima.linn)*
Thetran vithai chooranam (Strychnous potatorum)
Kadukkai thol chooranam (terminlia chebula)

} Equal quanitity

Ingredients 1,2,3,4 are ground separately with iron martar till it attains consistency. The fine chooranam is mixed well and preserved in a clean and dry glass.

Drug storge:

The trial drug Neerizhivu Chooranam is stored in a clean and dry glass bottles.

Dispensing

The chooranam is given in packets

Subject selection

As and when patients with symptoms of inclusion criteria reporting at OPD of PG Maruthuvam, Government Siddha Medical College, hospital will be subjected to screening test & documentation will be done using screening proforma.

Inclusion criteria:

1. Age 35 to 65 yrs.
2. Patients who are willing to attend the OPD regularly for the 48 days will be included in the clinical trial.
3. Patients who are willing to take treatment to take as IPD will be included in the clinical trial.
4. Patients who are reporting with the clinical symptoms such as polyurea, polydipsia, polyphagia, weight loss will be included in the clinical trail.
5. Patient who are reporting with general tiredness, burning feet, generalized / genital pruritus, tingling and numbness, delayed / non healing wounds/ ulcer will be included.
6. Blood sugar Fasting $\geq$ 125 % ; PP $\geq$ 170 mg % will be included in the clinical trial

Exclusion criteria:

1. Diabetic complications like neuropahy, retinopathy, etc.
2. Hypertension
3. Heart disease
4. Kidney disease
5. Liver diseases
6. Pancreatic disease like acute pancreatitis, carcinoma of pancreas etc…
7. Gestational diabetes, Type – 1 Diabetes
8. Pregnancy and Lactation
9. Patient not willing to give blood sample.

Withdrawl criteria:

1. Intolerance to the drug and development of adverse reactions during drug trial.
2. Poor patient compliance & Defaulters.
3. Patient turned unwilling to continue in the course of clinical trial
4. Occurrence of any serious illness

Tests and Assessments:

a) Clinical Assessments:

Polyuria, polydypsia, polyphagia, nocturia, tiredness, fatigue Sudden gain in weight, blurring of vision,pricking pain in both palm and soles,burning sensation in both soles and paresthesia in the feet,pruritis vulvae, balanitis.

b) Investigation:

Blood Test:

TC DC, ESR, Hb, sugar (Fasting & PP) Lipid profile,Liver function test, Renal function lest.

Urine Test:

Albumin,Sugar (Fasting and PP), Deposits

Bile salt,Bile pigments, Urobilinogen.

Clinical assessment &investigations-Siddha System:

Ennvagai thervugal-Naa,Niram, Mozhi, Vizhi, Sparism, Malam, Moothiram Naadi.

Moothiram

NEERKURI - Niram, Edai, Manam, Nurai, Enjal.

NEIKURI

Motion Test - Ova, Cyst, Occult blood.

METHODOLOGY

STUDY ENROLLMENT

In the Phase 11 study, patients reporting at the OPD with the clinical symptoms of Polyphagia, Polyuria, Polydipsia, nocturia etc.. will be examined clinically for enrolling in the study based on the inclusion and exclusion criteria.

The patients who are to be enrolled would be informed (Form IV-D) about the study, trial drug, possible outcomes and the objectives of the study in the language and terms understandable to them.

After ascertaining the patient's willingness, informed consent would be obtained in writing from them in the consent form .(Form-IVA)

All these patients will be given unique registration card in which patients' Registration number of the Study, Address, Phone number and Doctors phone number etc. will be given, so as to report easily should any complications arise. Complete clinical history, complaints and duration, examination findings-- all would be recorded in the prescribed Proforma in the history and clinical assessment forms separately.

Screening Form- I will be filled up; Form I-A, Form -11 and Form -111 will be used for recording the patients' history, clinical examination of symptoms and signs and laboratory investigations respectively. Patients would be advised to take the trial drug and appropriate dietary advice (Form IV-L:) would be given according to the patients' perfect understanding.

Conduct of the study:

The trial drug **Neerizhivu Chooranam** (Internal) is given continuously for 45 days.

For OP Patients, they should visit the hospital once in 7 days. At each clinical visit clinical assessment is done and prognosis is noted. For If Patients the drug is provided daily and prognosis is noted.

For IP patients also clinical assessment is done daily. Laboratory investigations are done 15°' day, 30 & 48 th day of the trial. For IP patients, who is not in a situation to stay in the hospital for a long time is advised to attend the OPD for further continuation of treatment. After the end of the treatment also, the patient is advised to visit the OPD for another 2 months for follow-up.

If any trial patient who fails to collect the trial drug on the prescribed day but wants to continue in the trial from the next day or two, he/she will be allowed , but defaulters of one week and more will not be allowed to continue and be withdrawn from the study with fresh case being inducted.

DATA MANAGEMENT

After enrolling the patient in the study, a separate file for each patient will be opened and all forms will be filed in the file. Study No. and Patient No. will be entered on the top of file for easy identification. Whenever study patient visits OPD during the study period, the

respective patient file will be taken and necessary recordings will be made at the assessment form or other suitable form.

The screening forms will be filed separately.

The Data recordings will be monitored for completion by HOD and adverse event by SrResearch Officer (Statistics). All forms will be further scrutinized in presence of Investigators by Sr.Research Officer (Statistics) for logical errors and incompleteness of data to avoid any bias. No modification in the results is permitted for unbiased reports.

OUT COME:

I Before treatment 2.After treatment

ADVERSE EFFECT / SERIOUS EFFECT MANAGEMENT:

If the trial patient develops any adverse reaction he/she would be immediately withdrawn from the trial and proper management will be given in OPD ofPG Maruthuvam Department of Government Siddha Medical College Hospital.

ETHICAL ISSUES

1. To prevent any infection while collecting the blood sample from the patient only disposable syringes , gloves with proper sterilization of lab equipments will be used.
2. No other external & internal medicines will be used. There will be no infringement on the rights of patient.
3. The data collected from the patient will kept confidentially. The patient will be informed about the diagnosis, treatment and follow up.
4. After the consent of the patient (through consent form) they will be enrolled in the study.
5. Informed consent will be obtained from the patient explaining understandable language to the patient.
6. Treatment would be provided free of cost.

7. In condition of treatment failure, any other adverse reactions developed, patient will be given alternative treatment at the Government Siddha Medical College hospital, Palayamkottai. with full care through the end.

ASSESSMENT FORM

1. FORM I SCREENING & SELECTION PROFORMA
2. FORM I A HISTORY PROFORMA ON ENROLLMENT
3. FORM II CLINICAL ASSESSMENT ON ENROLLMENT
4. FORM II A CLINICAL ASSESSMENT DURING & AFTER TRIAL
5. FORM III LABORATORY INVESTIGATION ON ENROLLMENT & CONCLUSION OF TRIAL
6. FORM IV A CONSENT FORM
7. FORM IV B WITHDRAWAL FORM
8. FORM IV C DRUG COMPLIANCE FORM
9. FORM IV D PATIENT INFORMATION SHEET
10. FORM IV E DIETARY ADVICE FORM
11. FORM IV F ADVERSE REACTION FORM.

RESULTS AND OBSERVATIONS

The results were observed with respect to the following criteria by clinical study on 20 out –patients and 20 In-patients.

1. Sex distribution
2. Age distribution
3. Kaalam distribution
4. Constitution of the body
5. Gunam
6. Religion
7. Occupation status
8. Socio Economic status
9. Habits
10. Dietary pattern
11. Paruva kaalam
12. Thinai distribution
13. Heriditary incidence
14. Weight distribution
15. Clinical manifestations
16. Assocoiated symptoms
17. Kosam
18. Derangement of mukkutram
    - ❖ Derangement of vatham
    - ❖ Derangement of Pitham
    - ❖ Derangement of Kabham
19. Ezhu udal kattugal
20. Envagai Thervugal
21. Neerkuri –Neikuri
22. Investigation tables

23.Grading of result

1. **Sex distribution**

Table – 1. Illustrates the Sex distribution and its relative percentage

	Sex	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Male	13	65	9	45
2.	Female	7	35	11	55

2. **Age distribution**

Table – 2. Illustrates the Age distribution and its relative percentage

S.No	Age group in years	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	31-40	1	5	-	-
2.	41-50	8	40	2	10
3.	51-60	4	20	9	45
4.	61-70	7	35	9	45
5.	71-80	-	-	-	-

Above table Shows, the incidence is high in age between 51-70.

3. **Kaalam**

Table – 3. Illustrates the Kaalam and its relative percentage

S.No	Age group in years	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Vatha Kaalam	-	-	-	-
2.	Pitha Kaalam	13	65	11	55
3.	Kapha Kaalam	7	35	9	45

From the above study, the maximum number of cases were treated in Pitha Kaalam

4. Constitution of the body

Table – 4. Illustrates the Constitution of the body and its relative percentage

S.No	Constitution of the body	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Vatha Thegi	-	-	-	-
2.	Pitha Thegi	-	-	-	-
3.	Kapha Thegi	-	-	-	-
4.	Thontha Thegi	20	100%	20	100%

In all, the patients had Thontha Thegam

5. Gunam

Table – 5. Illustrates the Gunam and its relative percentage

S.No	Gunam	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Sathuva gunam	-	-	-	-
2.	Rajao gunam	20	100%	20	100%
3.	Thamo gunam	-	-	-	-

In this present study cent percent cases belongs to Rajogunam.

6. Religion

Table – 6. Illustrates the Religion and its relative percentage

S.No	Religion	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Hindu	15	75	19	95
2.	Christian	4	20	1	5

3.	Muslim	1	5	-	-

In this study, the maximum number of patients were Hindus.

7. Type of work

Table – 7. Illustrates the Type of work and its relative percentage

S.No	Type of work	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Sedentary worker	5	25	4	20
2.	Moderate worker	7	35	10	50
3.	Hard worker	8	40	6	30

8. Socio Economic status

Table – 8. Illustrates the Socio Economic status and its relative percentage

S.No	Socio Economic status	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Poor	4	20	10	50
2.	Middle class	12	60	10	50
3.	Rich	4	20	-	-

From the above study, economically middle and poor class peoples were prone to diabetes.

9. Habits

Table – 9. Illustrates the Habits and its relative percentage

S.No	Habits	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Alcoholic	4	20	5	25
2.	Smoker	4	20	5	25

3.	Tobacco chewer	1	5	1	5
4.	None	15	75	14	70

10.Dietary Pattern

Table – 10. Illustrates the Dietary Pattern and its relative percentage

S.No	Dietary Pattern	Out patients		In patients	
		No.of cases	Percentage	No.of cases	Percentage
1.	Mixed diet	15	75	16	80
2.	Vegetarian	5	25	4	20

From the above study it clearly shows that mixed diet is more prone to diabetes.

11.Paruva Kaalam

Table – 11. Illustrates the Paruva Kaalam and its relative percentage

S.No	Paruva Kaalam	Months	Out patients		In patients	
			No.of cases	Percentage	No.of cases	Percentage
1.	Kaarkaalam	Aavani, Purattasi	10	50	11	55
2.	Koothir Kaalam	Iyppasi, Karthigai	2	10	4	20
3.	Munpani Kaalam	Markazhi, Thai	-	-	-	-
4.	Pinpani Kaalam	Masi, Panguni	-	-	-	-
5.	Elavenil Kaalam	Chithirai, Vaikasi	-	-	-	-

6.	Muthuvenil Kaalam	Aani, Aadi	8	40	5	25

The above table shows most of the patients were treated in Kaarkalam.

12. Thinai

Table - 12 Illustrates the Thinai and its relative percentage.

Sl.No.	Thinai	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Kurinji	-	-	-	-
2	Mullai	-	-	-	-
3	Marutham	20	100%	20	100%
4	Neithal	-	-	-	-
5	Paalai	-	-	-	-

Above the table shows most of the patients were from marutha nilam.

13. Family History

Table - 13 Illustrates the Family history and its relative percentage.

Sl.No	Hereditary incidence	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Paternal	8	40	7	35
2	Maternal	5	25	5	25
3	Both	3	15	6	30
4	No relevant history	4	20	2	10

From the above study hereditary factors plays an important role in this disease.

14. Weight Distribution

Table - 14 illustrates the Weight and its relative percentage.

Sl.No.	Weight	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Over weight	5	25	6	30
2	Ideal Weight	13	65	10	50
3	Under Weight	2	10	4	20

The above table shows the role of the obesity in the incidence of the disease.

15. Clinical Manifestations features:

Table-15: Illustrates the clinical manifestations and its relative percentage.

S. No.	Clinical Manifestations	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Polyuria	20	100	20	100
2	Polyphagia	8	40	20	100
3	Polydipsia	16	80	20	100
4	Nocturia	20	100	20	100
5	Weight loss	7	35	10	50
6	Pain	8	40	12	60
7	Tiredness	5	25	20	100
8	Peripheral Neuropathy (Numbness)	10	50	5	25
9	Ulceration	-	-	-	-
10	Blurring vision	-	-	-	-

All the patients get affected with polyuria and nocturia.

16. Associated Symptoms :

Table-16: Illustrates the Associated Symptoms and its relative percentage.

S. No.	Associated Symptoms	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Balanitis	-	-	-	-
2	Pruritis vulvae	4	20	3	5
3	Arthropathy	4	20	5	25
4	Giddiness	-	-	-	-
5	Impotency	-	-	-	-
6	Libido	-	-	-	-
7	Constipation	5	25	4	20

From the above study some patients had one or more symptoms as listed above.

17. Kosam

Table-17 : Illustrates the Kosam and its relative percentage.

Sl.No.	Kosam	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Annamaya Kosam	20	100	20	100
2	Pranamaya Kosam	-	-	-	-
3	Manomaya Kosam	8	40	7	35
4	Vingnanamaya Kosam	6	30	6	30
5	Ananthamaya Kosam	-	-	-	-

In all the patients , Annamayakosam gets affected.

18. Disturbances in Vatha

Table : 18 Illustrates the disturbances in Vatha and its relative percentage.

Sl.No.	Vatham	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Pranan	-	-	-	-
2	Abanan	15	75	16	80
3	Viyanan	8	40	9	45
4	Udhanan	17	85	16	80
5	Samanan	12	60	15	75
6	Nagan	-	-	-	-
7	Koorman	-	-	-	-
8	Kirukaran	5	25	7	35
9	Devathathan	6	30	7	35
10	Dhananjeyan	-	-	-	-

Above table shows most of the cases had altered Abanan, Udhanan & Samanan

19. Disturbances in Pitham

Table.19 Illustrates the disturbances in Pitham and its relative percentage.

Sl. No.	Pitham	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Anarpitham	15	75	20	100
2	Ranjagapitham	-	-	-	-
3	Prasakapitham	4	20	5	25
4	Alosagapitham	-	-	-	-
5	Sathagapitham	-	-	2	10

Above the table shows most of the cases had altered anarpitham.

20 . Disturbances in Kapham

Table.20 Illustrates the disturbances in Kapham and its relative percentage.

Sl. No.	Kapham	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Avalambagam	-	-	-	-
2	Kilethagam	15	75	20	100
3	Pothagam	-	-	-	-
4	Tharpagam	-	-	-	-
5	Santhigam	7	35	9	45

Above the table shows most of the cases had altered Kilethagam

21. Involvement of Ezhu Udalkattugal

Table : 21. Illustrates the involvement of ezhu Udalkattugal and its relative percentage.

Sl. No.	Udalkattugal	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Saaram	15	75	16	80
2	Senneer	14	70	14	70
3	Oon	6	30	7	35
4	Kozhuppu	-	-	-	-
5	Enbu	8	40	7	35
6	Moolai	-	-	-	-
7	Sukkilam/ Suronitham	-	-	-	-

From the above study all the patients had altered Saaram .

22. Envagai Thervugal

Table 22 : Illustrates the condition of envagai Thervugal and its relative percentage.

Sl.No.	Envagai Thervugal	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Naadi	20	100	20	100
2	Sparisam	10	50	5	25
3	Naa	12	60	17	85
4	Niram	-	-	-	-
5	Mozhi	-	-	-	-
6	Vizhi	-	-	-	-
7	Malam	5	25	4	20
8	Moothiram	20	100	20	100

In all the patients, Moothiram get affected. All the patients showed Pitha Kalapu Naadi (Pitha vatham and Vathapitham).

23. Neerkuri – Neikuri

Table : 23 Illustrates the Neerkuri - Neikuri and its relative percentage.

Sl. No	Type of test result	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Neerkuri (straw yellow in colour & clear)	20	100	20	100
2	Neikuri				
	a. Aravena neendathu	11	55	14	70
	b. Aazhi pol paraviyathu	-	-	-	-
	c. Muthothu nindrathu	4	20	3	15
	d. Thonthaneer	5	25	3	15

In this present study of neerkuri showed straw yellow in colour and honey odour. Most of the patients had Vaathaneer.

24. Assessment of Result :

Table : 24 Illustrates the Assessment of Results and its relative percentage.

Sl.No.	Result	Out patients		In patients	
		No. of cases	%	No. of cases	%
1	Good Response	17	85	18	90
2	Moderately Response	3	15	2	10
3	Poor Response	-	-	-	-

Most of the patients showed good results. At the end of the treatment the inpatients were discharged and they were advised to follow up treatment in OPD of P.G. Department of maruthuvam.

DISCUSSION

Madhumegam is a group of common metabolic disorder characterised by excessive urination and hyperglycemia. The signs and symptoms of madhumegam are well defined by Yugi munivar in the book of Yugi vaidhya chinthamani800. If neglected to treat the disease Madhumegam, it produces various type of complications. So the author has choosen the disease to control madhumegam and prevent the complications of madhumegam. “Madhumegam” which is mentioned in siddha literatures is almost correlated with type 2 diabetes mellitus (Non insulin dependent diabetes mellitus-NIDDM) as in allopathic system of medicine.

The present study is a preliminary one. Twenty patients of both sexes were observed as out-patient and twenty patients were admitted as In-patient in the PG maruthuvam department of Govt. Siddha medical college, Palyamkottai. After careful analysis of their clinical symptoms, under the supervision of Professor, Reader and Assistant Lecturers of the maruthuvam Department, all the patients were administered with the trial medicines regularly. The observations were recorded and discussed under the following parameters.

1. Sex Distribution:-

Among 20 out - Patients 65% of cases were males and 35% of cases were females.

Among 20 In-Patients 45% of cases were males and 55% of cases were females.

2. Age distribution:-

Among 20 out – Patients 5% were in the age group between 31-40,40% cases were in the age group between 41 – 50,20% cases were in

the age group between 51-60,35% cases were in the age group between 61 -70.

Among 20 In patients 10% were in the age group between 41-50. 45% were in the age group between 51-60, 45% cases were in the age group between 61-70.

3. Kaalam:

Among 20 out – Patients no cases were reported in vatha kaalam, 65% of cases belongs to pitha kaalam and 35% of cases belongs to kaphakaalam.

Among 20 In-Patients no cases in vathakaalam 55% cases belongs to Pithakaalam 45% of cases belongs to Kapha Kalam.

The maximum number of cases were reported in pithakaalam.

4. Thegi:

Among 20 In-Patients and 20 out patients cent percent had thontha thegam as their bodies were constituted by mixed characters of vatha, pitha and kabham.

5. Gunam:

In this present study cent percent cases belongs to Rajogunam.

6. Religious distribution:

Among 20 out Patients 75% were Hindus, 20% were Christians and 5% Muslim.

Among 20 In – Patients 95% were Hindus and 5 % cases were christian.

7. Occupational status:

In 20 Out patients study 25% cases were sedantary worker, 35% cases were moderate worker, 40% cases were hard worker.

In 20 In patients study 20% cases were sedentary worker, 50% cases were moderate worker 30% cases were Hard worker.

8. Socio-economic status:

Among 20 out patients 20% were from poor socio economic status,60% cases were from middle class family and 20% of cases were form Rich Family.

Among 20 In patients 50% cases were from poor socio - economic status, 50% cases were from middle class family.

From the above study economically poor and middle class people were more prone to diabetes.

9. Habits:

In 20 out patient study 20% cases had a habit of alcohol, 20% cases had a habit of smoking 5% cases had a habit of Tobacco chewing and 75% of cases had none of these habits.

In 20 In patients study 25% cases had a habit of alcohol, 25% cases had a habit of smoking 5% cases had a habit of Tobacco chewing and 70% of cases had none of these habits.

10.Dietary Pattern:

In 20 out patients study 75% of cases had a habit of mixed diet and 25% of cases had a habit of vegetarian diet.

In 20 In patients study 80% cases had habit of mixed diet and 20% cases had a habit of vegetarian diet.

From the above study it clearly shows that mixed diet is more prone to madhumegam.

11.Paruvakaalam:

In 20 out-patients study 50% cases were observed in kaarkalam , 10% cases were observed in koothir kalam and 40% cases were observed during muthuvenil Kaalam.

In 20 In patients study 55% cases were observed during kaarkaalam 20% cases were observed during Koothirkkalam and 25% cases were observed during muthuvenil kaalam.

During this study majority of cases were identified in muthuvenil kaalam.

12.Thinai:

Among 20 In –Patients and 20 out – patients cent percent were from marutham.

13.Family history:

In 20 out-patients study 40% cases had paternal positive family history, 30% cases had maternal positive family history 15% cases had both paternal and maternal family history and 25% had no relevant history.

In this present study out of 20 In patients 35% cases had paternal positive family history, 25% cases had maternal positive family history, 30% cases had both paternal and maternal family history, and 10% had no relevant history.

From the above study hereditary plays and important role in this disease.

14.Weight distribution:

In 20 out patients study 25% cases were overweight, 65% cases were ideal weight and 10% cases were under weight.

In 20 in patients study 30% cases were overweight, 50% cases were ideal weight and 20% cases were under weight.

From the above study obesity plays an important role. It is also prevalent in ideal and underweight people.

15.Clinical manifestations:

In 20 out patients cent percent cases had polyuria, and nocturia, 40% cases had polyphagia, 80% cases had polydipsia, 35% cases had

weight loss, 50% cases had peripheral Neuopathy, 25% cases had Tiredness.

In 20-In patients study cent percent cases had polyuria and Poly phagia, polydipisa, and Nocturia, 50% cases had weight loss, 20% cases had tiredness, 60% of cases had pain.

Some patients had one or two or many symptoms as listed above .

16.Associated symptoms:

In 20 out patients 20% cases had pruritis valvae. 20% cases had arthropathy and 25% cases had constipation .

In 20 In- Patients 25% cases had arthropathy and5% cases had pruritus vulvae and 20% had constipation .

Some patients had two or many symptoms as listed above.

17.Kosam:

In 20 out patients Annamayakosam altered in cent percent patients, Manomayakosam was altered in 40% patients, Vingnanamayakosam was altered in 30% patients.

In 20 In patients study Annamaya kosam was affected in cent percent patients, Manomayakosam was altered in 35% patients, Vingnanamayakosam was altered in 30% patients.

18.Disturbances in Vatham:

In 20 out patients study 75% of cases had altered abanan 40% of cases had altered Viyanan and 85% of cases had altered udhanan, 60% of cases had altered samanan and 25% cases had altered kirukaran and 30 % of the cases had altered Devathathan.

In 20 In patients study 80% of cases had altered Abanan and Udhanan 45% has altered Viyanan, 75% has altered Samanan and 35% of cases had altered Kiruharn and Devathathan.

19.Disturbances in pitham:

In 20 out patients 75% cases had altered Anarpitham 20% of cases had altered prasagapitham. In both Ip and OP study most of the cases had altered Anarpitham.

In 20 In patients study 100% of cases had Altered Anarpitham, 25% of cases had altered prasagapitham, 10% of cases had altered sathaga pitham.

20.Disturbances in Kabham:-

In 20 out patients study 75% of cases had altered kilethagam, 35% of cases had altered santhigam.

In 20 in patients study cent percent of cases had altered Kilethagam and 45% of cases had altered santhigam.

21.Ezhu udalkattugal:-

In 20 out patients study saaram was affected in 75% cases. Seneer was affected in 70% of the cases. oon was affected in 30% of cases, enbu was affected in 40% of cases.

In 20 in patients study 80% of cases had altered saaram. 70% of the cases has altered seneer. Oon was affected in 35% of cases,Enbu was affected in 35% of cases. Affected saaram produces general debility

- Affected oon produces ill built.
- Affected Enbu produces pain in the knee joint and shoulder joint.

22.Envagai Thervugal:-

In 20 Out patients study moothiram and naadi was affected in cent percent of cases. Naa was affected in 60% of cases and sparisam was affected in 50% of cases, malam was affected in 25% of cases.

In 20 In patients study mothiram and naadi was affected in cent percent of cases. Sparisam was affected in 25% of cases. Naa was affected in 85% of cases and malam was affected in 20% of cases.

23.Neerkuri and Neikuri:-

In this present study urine sample of cent percentage of both IP and OP patients showed straw yellow in colour and clear and honey odour. The drop of oil lengthens like a snake or ring or pearl in the patients urine sample it indicates Vathaneer, pitha neer, kabhaneer respectively.

In O.P study 55% spreads like snake, 20% spreads like pearl, thontha neer present in 25% of cases. In I.P study 70% spreads like snake. (Vathaneer) 15% spreads like pearl (kabha Neer) and thonthaneer present in 15% of cases.

24.Gradation of results:

Among out patients 90% showed good result and 10% showed fair result, among in patients 85% showed good result, 15% showed Fair result,

After the treatment all the in patients and out patients had significant symptomatic improvement. Frequency of micturition was found to be reduced. Especially excessive appetite, numbness and burning sensation on foot were also reduced.

At the end of the treatment the inpatients were discharged and they were advised to follow up treatment in P.G. Department of Maruthuvam O.P for further management.

SUMMARY

Madhumegam is the most commonly occurring disease which affects both sexes, the age group above 40yrs. By its prevalance it seeks proper medical attention in the early stage, otherwise it leads to several complications like diabetic retinopathy, neuropathy, nephro-angiopathy and diabetic foot ulcer etc.

These complications are prevented by controlling this disease by proper treatment and diet management. So the author had chosen this disease and had provided more efforts.

The disease is well correlated with “Diabetes mellitus” (NIDDM) due to its classical signs and symptoms.

“Neerizhivu choornam” was taken as a trial medicine for this dissertation work. The aetiology, pathology, classification, clinical features, diagnosis, treatment and prevention were collected from available literatures from both Siddha system and modern system of medicine.

In this study 40 patients of both sexes at 30 – 70 different age groups with classical clinical symptoms were selected and 20 patients were taken as in patients and another 20 patients were taken as out patients.

All the patients were examined by Siddha methodology such as poriyal arithal, pulanal arithal, vinavuthal, envagai thervugal and naadi paritchai.

According to modern methodology, routine investigations like blood, urine and motion were analysed in all cases.

The trial medicine Neerizhivu choormam was administered to all the selected patients, in the dose of 2 gm ; 2 times a day ; with Butter milk.

Among O.P and I.P patients, all cases showed significant symptomatic improvement.

Poly uria, nocturia, excessive appetite, numbness, tiredness and burning of foot were also reduced.

Blood sugar and urine sugar was with in normal limit for 85% of cases, whereas 15% of cases showed moderate decrease in blood and urine sugar.

All the durgs in **Neerizhivu choornam** are purely herbal. The potent antidiabetic drugs are Aavarai, kadukaai, Thetran vithai and vilam pisin as per siddha literature.

Biochemical Analysis of Neerizhivu choornam showed the presence of calcium,sulphate, ferrous iron, unsaturated compounds, tannic acids and reducing sugar.

Pharmacological study – The trial drug neerizhivu chooranam was oral anti – hyperglycemic effect was observed.

CONCLUSION

- In this research clinical results found to be good in 85% of IP cases, 90% of Op cases, Fair in 15% of IP cases, 10% of Op cases.
- Clinically the trial medicine was very effective to the suffering patients and relieved from the symptoms.
- Further follow up of all these patients showed efficacy of medicine.
- Clinical study showed no adverse effects of trial medicine during this study.
- So it is concluded that madhumegam is controlled by Neerizhivu chooranam.

PREPARATION AND PROPERTIES OF TRIAL MEDICINE NEERIZHIVU CHOORANAM

Preparation:

Dried seeds of Aavarai, Thetran, and outer covering of kadukkai, (un ripe fruit rind of Terminalia chebula) vilam pisin are collected and finely powdered and filtered by vasthra kayam process (filtration through cloth). Now the medicine is ready to use.

Dose:

2gm; two times a day; after food.

Adjuvant:

Butter milk

Uses:

Madhumegam

Expiry:

3 month from the time of preparation.

Reference:

The pharma copoeia of siddha Research Medicines - specific medicine (Page No. 52)

Drug Description:

Cassia auriculata - ஆவாரை

வேறுபெயர் : ஆவரை, ஆவிரை, ஆகுலி, ஏமபுட்பி, மேகாரி, தலபோடம் .

பயன்படும் உறுப்புகள்: இலை, பூ, பட்டை, விதை, வேர், பிசின்.

சுவை : துவர்ப்பு

தன்மை : தட்பம்

பிரிவு : இனிப்பு

விதையின் செய்கை

குளிர்ச்சியுண்டாக்கி

செந்நீரிளக்கி

பொதுகுணம்

"சொல்லுதற்கு மட்டோ தொலையாத மேகநீர்
எல்லா மொழிக்கும் மெரிவகற்று - மெல்ல வச
மாவாரைப் பம்பரம்போ லாட்டுந் தொழிலணங்கே
யாவாரை முலி யது"

- **தேரையர் குணவாகடம்**

Uses:

- Used in Diabetes
- Urinary Tract Diseases
- Leucorrhoea
- Dysentry
- Eye diseases

2. Strychnos Pota torum – தேற்றான்

வேறு பெயர்	:	இல்லம், சில்லம், கதகம், தேறு
பயன்படும் உறுப்புகள்	:	பழம், விதை
சுவை	:	கைப்பு
தன்மை	:	வெப்பம்
பிரிவு	:	கார்ப்பு

விதையின் செய்கை

- உடற்தேற்றி
- உரமாக்கி
- பசித்தீத் தூண்டி
- உள்ளழலாற்றி

பொதுகுணம்

"தேற்றான் விதையது தான் தீபனத்தைப் போக்கும்
ஆற்றமிரு கண்ணுக் கருமருந்தாம் - கூற்றா
யிருத்துங் கிரிச்சரத்தை எங்குமிலா தோட்டுங்
குருத்துவ முண்டாக்குங் குறி"

- அகத்தியர் குணபாடம்

Medicinal Uses:

- Leucorrhoea
- Veneral Diseases
- Polyphagia
- Burning micturation
- Eye Diseases
- Chronic Diarrhoea
- Bronchitis
- Anaemia and Oedema

3. Terminalia Chebula – கடுக்காய்த் தோல்

வேறு பெயர்	:	அங்ஙணம், அபரணம் அரிதகி, வனதுர்க்கி, பத்தியம், கடு, வரிக்காய்
பயன்படும் உறுப்பு	:	பிஞ்சு, பழம்
சுவை	:	முக்கிய சுவை துவர்ப்பு அத்துடன் சிறிது இனிப்பு, புளிப்பு, கார்ப்பு, கைப்பு
தோல்	:	கார்ப்பு சுவை

பொது குணம்:

" தாடை கழுத்தக்கி தாலு குறியி விடப்
பீடை சீலிபதமுற் பேதி முடம் - ஆடையெட்டாத்
தூலமிடி புண்வாத சோணி காமாலை யிரண்
டூலமிடி போம் வரிக்காயால்"

Medicinal Use:

- Poly uria
- Opthalmic Diseases
- Anaemia, Anorexia
- Liver Diseases
- Diarrhoea and Dysentry
- It has a nourishing and restorative effect on the central nervous system.
- It cures the tingling sensation in feet.

4. Limonia acidissima – விளா மரம்

வேறு பெயர்	:	கடிப்பகை, கபித்தம், விளவு, வெள்ளில்
பயன்படும் உறுப்புகள்	:	இலை,காய், பழம், பழ ஓடு, பிசின்
பிசினின் செய்கை	:	உள்ளழலாற்றி ___ Demulcent

பொது குணம்:

" நல்ல விளாம்பிசினை நற்பாகஞ் செய்தருந்த
தொல்லை யதிசாரந் தொலைவ தென்றோ - மெல்லியரால்
வந்த வெள்ளை தன்னுடனே மாதர் பெரும்பாடும்
உந்து நீர்ப் போக்குமோம் உன்"

- **அகத்தியர் குணவாகடம்**

Medicinal Uses:

- It cures diabetes
- Used in Diarrhoea and Dysentry
- Uesful in Leucorrhoea and Menorrhogia.

BIO-CHEMICAL ANALYSIS

NEERIZHIVU CHOORANAM

PREPARATION OF THE EXTRACT

5 gms of the drug was weighed accurately and placed in a 250ml clean beaker. Then 50ml of distilled water is added and dissolved well. Then it is boiled well for about 10 minutes. It is cooled and filtered in a 100ml volumetric flask and then it is make up to 100ml with distilled water. This fluid is taken for analysis.

QUALITATIVE ANALYSIS

S.No.	EXPERIMENT	OBSERVATION	INFERENCE
1.	**1. TEST FOR CALCIUM** 2ml of the above prepared extract is taken in a clean test tube. To this add 2ml of 4% ammonium oxalate Solution.	A white precipitate is formed.	Indicates the presence of calcium.
2.	**TEST FOR SULPHATE** 2ml of the extract is added to 5% Barium chloride solution.	A white precipitate is formed.	Indicates the presence of sulphate.
3.	**TEST FOR CHLORIDE** The extract is treated with Silver nitrate Solution.	No white precipitate is formed.	Absence of chloride.
4.	**TEST FOR CARBONATE** The substance is treated with Concentrated HCL.	No brisk effervessence is formed.	Absence of Carbonate.
5.	**TEST FOR STARCH** The extract is added with weak iodine solution.	No blue colour is formed.	Absence of starch.

6.	**TEST FOR FERRIC IRON** The extract is acidified with Glacial acetic acid and add Potassium ferro cyanide.	No blue colour is formed.	Absence of ferric Iron.
7.	**TEST FOR FERROUS IRON** The extract is treated with Concentrated nitric acid and Ammonium thio cyanate solution.	Blood red colour is formed.	Indicates the presence of ferrous Iron.
8.	**TEST FOR PHOSPHATE** The extract is treated with ammonium Molybdate and concentrated nitric acid.	No yellow precipitate is formed.	Absence of phosphate.
9.	**TEST FOR ALBUMIN** The extract is treated with Esbatch's Reagent.	No yellow precipitate is formed.	Absence of Albumin.
10.	**TEST FOR TANNIC ACID** The extract is treated with ferric Chloride.	Blue black precipitate is formed.	Indicates the presence of Tannic acid.
11.	**TEST FOR UNSATURATION** Potassium permanganate solution is added to the extract.	It gets decolourised.	Indicates the presence of unsaturated compound.

12.	**TEST FOR THE REDUCING SUGAR** 5ml of Benedict's qualitative Solution is taken in a test tube and allowed to boil for 2 mins and add 8-10 drops of the extract and again boil it for 2 mins.	Colour change occurs.	Indicates the presence of Reducing sugar.
13.	**TEST FOR AMINO ACID** One or two drops of the extract is placed on a filter paper and dried it well. After drying 1% Ninhydrin is sprayed over the same and dried it well.	No violet colour is formed.	Absence of Amino acid.
14.	**TEST FOR ZINC** The extract is treated with Potassium ferrocyanide.	No white precipitate is formed.	Absence of Zinc.

INFERENCE

The given sample of NEERIZHIVU CHOORANAM indicates the presence of Calcium, Sulphate, Ferrous Iron, Reducing Sugar, Unsaturated Compounds, and Tannic Acid.

ANTI-HYPERGLYCEMIC EFFECT OF NEERIZHIVU CHOORANAM IN EXPERIMENTAL DIABETES AND THEIR EFFECTS ON KEY METABOLIC ENZYMES INVOLVED IN CARBOHYDRATE METABOLISM.

INTRODUCTION

Diabetes mellitus is a metabolic disorder in which the body does not produce or properly utilize insulin. It causes disturbance in carbohydrate, protein and lipid metabolism and complications such as retinopathy, microangiopathy and nephropathy. In practical terms, diabetes mellitus is a condition in diabetes, a profound alteration in the concentration and composition of lipid occurs. The global figure of people with diabetes set rise from the current estimate of 150-220 million in 2010 and 300 million in 2025.

Despite the immense strides that have been made in the understanding and management of diabetes the disease and disease related complications are increasing unabated. In spite of the presence of known anti-diabetic medicine in the pharmaceutical market, remedies from siddha medicine are used with success to treat this disease. Many siddha preparation for diabetes are used throughout the world and there is an increasing demand by patients to use the chooranam with anti-diabetic activity.

Siddha drugs are used widely even when their biologically active compounds are unknown, because of their effectiveness, minimal side effects in clinical experience and relatively low cost. There are several siddha preparation are used in the treatment of diabetes and diabetic associated hyperlipidemia, among this siddha preparation the new preparation Neerizhivu chooranam is selected for the present study.

The present investigation is undertaken to the study the effect of Neerizhivu chooranam on changes in Body weight, Plasma glucose,

RBC, WBC, HB, Platelets, Hepatic glucokinase & hexokinase, Glucose-6-phosphate and Glycogen content.

EXPERIMENTAL MODELS

For the study of anti-diabetic and their effect on key metabolic enzymes involved in carbohydrate metabolism, an experimental model is selected in such a way that it would satisfy the following:

- The animal should develop hyperglycemia rapidly.
- Pathological changes in the site of induction should result from pancreatitis or damage of β-cells.
- The symptoms should be ameliorated or prevented by a drug treatment effective in human beings.
- The drug tested must be administered orally.
- Drug dosage should approximate the optimum therapeutic range for human, scaled the test animal weight.

Selection of Laboratory Model

- Animals such as sheep, cats, dogs, rats, rabbit and guinea pigs have been used in the experimental study of pancreatitis.
- Rats are the most common model used in the study of diabetics.
- In the presence study the rats have been used because, the glucose metabolism of rat resembles human glucose metabolism believed to contribute to diabetes.

MATERIALS AND METHODS

Materials:

Animals : **A**lbino wistar rats (180-200gm)

Drugs : Neerizhivu chooranam & Glipizide (Micro Labs, Hosur)

Chemical: Alloxan monohydrate (S. D Fine. Chem. Ltd, Mumbai)

Selection & acclimatization of animals:

Wistar strains of albino rats weighing between 180-220gm are used for this study. The animals were housed in large spacious cages and they were fed with commercial pellets and access to water *ad libitum*. The animals were well acclimatized to the standard environmental condition of temperature (22^0c ± 5^0c) and humidity (55 ±5%) and 12 hr light dark cycles throughout the experimental period.

INDUCTION OF DIABETES MELLITUS

Diabetes mellitus is induced in wistar rats by single intraperitoneal injection of freshly prepared solution of Alloxan monohydrate (150mg/kg BW) in physiological saline after overnight fasting for 12hrs.[1]

Alloxan is commonly used to produce diabetes mellitus in experimental animals due to its ability to destroy the β-cells of pancreas possibly by generating the excess reactive oxygen species such as H_20_2, 0_2 and $H0^-$. The development of hyperglycemias in rats is confirmed by plasma glucose estimation 72 hrs post alloxan injection. The rats with fasting plasma glucose level of 200-260mg/dl were used for this experiment.

Experimental procedure:

IAEC, K.M.College of Pharmacy, Madurai has approved this experimental procedure.

In the experiment a total of 30 rats (24 diabetic surviving rats & 6 normal rats) were used. Diabetes was induced in rats 3 days before starting the experiment. The rats were divided into 5 groups after the induction of alloxan diabetes. In the experiment 6 rats were used in each group.

TREATMENT PROTOCOL

- Group-I: (Normal control) consist of normal rats given with 10ml/kg of normal saline, orally.
- Group-II: (Toxic control) Diabetic control received 150mg/Kg of Alloxan monohydrate through I.P.
- Group-III: (positive control) Diabetic rat received Glipizide (10mg/Kg i.p)[2] for 28 days, orally.
- Group-IV: (Treatment group) Diabetic rat received low dose (200mg/Kg) of Neerizhivu chooranam daily using intra-gastric tube for 28 days.
- Group-V: (Treatment group) Diabetic rat received high dose (400mg/Kg) of Neerizhivu chooranam daily using intra-gastric tube for 28 days.

METHODOLOGY

Sample collection:

After 28 days of treatment, the blood glucose level and body weight was measured. Then blood was collected retro-orbitally from the eye under light ether anaesthesia using capillary tubes. Blood was collected in fresh vials containing EDTA as anticoagulant agents and plasma was separated in a T8 electric centrifuge at 2000 rpm for 2 minute. Then animal was sacrificed by decapitation. Liver and pancreas were immediately dissected out, washed in ice-cold saline to remove the blood. And liver was used for estimation of enzyme activity while pancreas was subjected to histopathological studies.

BIOCHEMICAL ANALYSIS

Estimation of blood glucose

Blood glucose was estimated by commercially available glucose kit (One Touch Ultra) Johnson Johnson based on glucose oxidase method. [3]

Hepatic glucokinase and hexokinase activity

The liver was perfused with ice cold 0.15M Kcl and 1mM EDTA solution and homogenized with twice its weight of ice cold buffer (0.01 cysteine and 1mM EDTA in 0.1 ml Tris-HCL,pH 7.4) and centrifuged for 20 minute at 4^0C. Glucose phosphorylation was assayed by means of the glucose 6 phosphate dependent spectrophotometric method. [4]

Glucose-6-phosphatase activity

The liver was homogenized with 40 times its weight of ice cold buffer (0.1 citrate-KOH, pH 6.5) and filtered through cheese cloth. Glucose-6-phosphatase activity was measured by phosphate release by the method Marjorie. The determination of phosphoric acid concentration in assay mixture was done colorimetrically. [5]

Glycogen Content

The tissue sample was digested by hot concentrated 30% KOH and treated with anthrone reagent. Glycogen content was determined colorimetrically. [6]

Haemetological and Biochemical parameters

Blood samples were assessed for RBC, WBC, HB, and Platelets with an auto analyzer (MISPA-EXCEL, Japan).

Histopathological examination

Pancreas tissue section was fixed in 4g/L formaldehyde and embedded in paraffin. Paraffin section was then stained with Hematoxylin-eosin. [7] Each sample was observed at 400X magnification and scored according to the injuries. [8]

Statistical analysis-

The data for different biochemical parameters were analyzed by using ONE WAY ANOVA followed by Newman Keul's multiple range test.

TABLE NO: 1

Effect of body weight of normal and experimental animals in each group

GROUPS	INITIAL BODY WEIGHT (gram)	FINAL BODY WEIGHT (gram)
GROUP I (G 1)	212.22 ± 4.16	216.30 ± 4.58
GROUP II (G 2)	200.95 ± 4.52	150.45 ± 2.10*[a]
GROUP III (G 3)	214.12 ± 4.25	222.30 ± 4.69*[b]
GROUP IV (G 4)	210.20 ± 5.28	226.36 ± 4.56*[b]
GROUP V (G 5)	212.26 ± 5.20	220.6 ± 4.23*[b]

G1- Normal Control; **G2**- Diabetic Control; **G3**- Positive control (Glipizide);

G4- Treatment group 200mg/kg; G5- Treatment group 400mg/kg.

- Values are expressed as Mean ± SEM.
- Values were find out by using ONE WAY ANOVA followed by Newman Keul's multiple range tests.
- *a values were significantly different from normal control (G 1) at (P<0.01)
- *b values were significantly different from diabetic control (G 2) at (P<0.01)

TABLE No: 2

Effect of 4 week treatment with various doses of Neerizhivu chooranam on glucose levels (mg %) in alloxan diabetic rats.

GROUPS	0^{TH} DAY	14^{TH} DAY	28^{TH} DAY
GROUP I (G 1)	76.8 ± 5.32	75.80 ± 4.75	70.35 ± 4.28
GROUP II (G 2)	158.68 ± 5.32	172.26 ± 6.30*[a]	216.6 ± 7.28*[a]
GROUP III (G 3)	190.6 ± 5.26	146.45 ± 4.30*[b]	136.72 ± 3.72*[b]
GROUP IV (G 4)	196.32 ± 3.88	157.32 ± 4.44*[b]	150.22 ± 4.50*[b]
GROUP V (G 5)	192.58 ± 4.25	160.25 ± 4.30*[b]	148.30 ± 4.15*[b]

G1- Normal Control; **G2**- Diabetic Control; **G3**- Positive control (Glipizide);

G4- Treatment group 200mg/kg; G5- Treatment group 400mg/kg.

- Values are expressed as Mean ± SEM.
- Values were find out by using ONE WAY ANOVA followed by Newman Keul's multiple range tests.
- *a values were significantly different from normal control (G 1) at (P<0.001)
- *b values were significantly different from diabetic control (G 2) at (P<0.001)

TABLE NO: 3

Effect of administration of various doses of Neerizhivu chooranam on glycogen content (mg/gm tissue) of liver tissue of rats.

GROUPS	**LIVER TISSUE GLYCOGEN CONTENT (mg/g tissue)**
GROUP I (G 1)	40.30 ± 2.32
GROUP II (G 2)	8.23 ± 0.50*[a]
GROUP III (G 3)	32.26 ± 1.60*[b]
GROUP IV (G 4)	24.40 ± 1.10*[b]
GROUP V (G 5)	26.82 ± 1.35*[b]

G1- Normal Control; **G2**- Diabetic Control; **G3**- Positive control (Glipizide);

G4- Treatment group 200mg/kg; **G5**- Treatment group 400mg/kg.

- Values are expressed as Mean ± SEM.
- Values were find out by using ONE WAY ANOVA followed by Newman Keul's multiple range tests.

- *a values were significantly different from normal control (G 1) at (P<0.001)
- *b values were significantly different from diabetic control (G 2) at (P<0.001)

TABLE NO: 4

Effect of administration of various doses of Neerizhivu chooranam on enzymes involved in carbohydrate metabolism in rats.

GROUPS	HEXOKINASE (µg/mg)	GLUCOSE-6-PHOSPHATE (µg/mg)	GLUCOKINASE (µg/mg)
GROUP I (G 1)	0.212 ± 0.014	0.396 ± 0.012	25.38 ± 1.40
GROUP II (G 2)	0.094 ± 0.005*[a]	0.128 ± 0.008*[a]	4.90 ± 0.30*[a]
GROUP III (G 3)	0.126 ± 0.008*[b]	0.320 ± 0.011*[b]	16.12 ± 0.96*[b]
GROUP IV (G 4)	0.119 ± 0.004*[b]	0.265 ± 0.010*[b]	12.10 ± 0.52*[b]
GROUP V (G 5)	0.142 ± 0.007*[b]	0.305 ± 0.012*[b]	14.20 ± 0.92*[b]

G1- Normal Control; **G2**- Diabetic Control; **G3**- Positive control (Glipizide);

G4- Treatment group 200mg/kg; **G5**- Treatment group 400mg/kg.

- Values are expressed as Mean ± SEM.
- Values were find out by using ONE WAY ANOVA followed by Newman Keul's multiple range tests.
- *a values were significantly different from normal control (G 1) at (P<0.001)
- *b values were significantly different from diabetic control (G 2) at (P<0.001)

TABLE NO: 5

Effect of administration of various doses of Neerizhivu chooranam on haematological parameters.

GROUPS	WBC × 10^3/µL	RBC × 10^6/µL	HB % gm/dL	PLATELET × 10^3/Ml
GROUP I (G 1)	8.46 ± 0.62	6.52 ± 0.32	12.35 ± 0.62	312.42 ± 38.80
GROUP II (G 2)	8.12 ± 0.70	6.90 ± 0.16	13.20 ± 0.42	295.20± 13.30
GROUP III (G 3)	7.50 ± 0.40	6.52 ± 0.48	14.26 ± 0.40	280.23 ± 30.90
GROUP IV (G 4)	7.20 ± 0.34	7.80 ± 0.22	12.95 ± 0.60	312.80 ± 18.92
GROUP V (G 5)	8.76 ± 0.82	6.80 ± 0.36	11.72 ±0.60	314.42 ± 14.40

G1- Normal Control; **G2**- Diabetic Control; **G3**- Positive control (Glipizide);

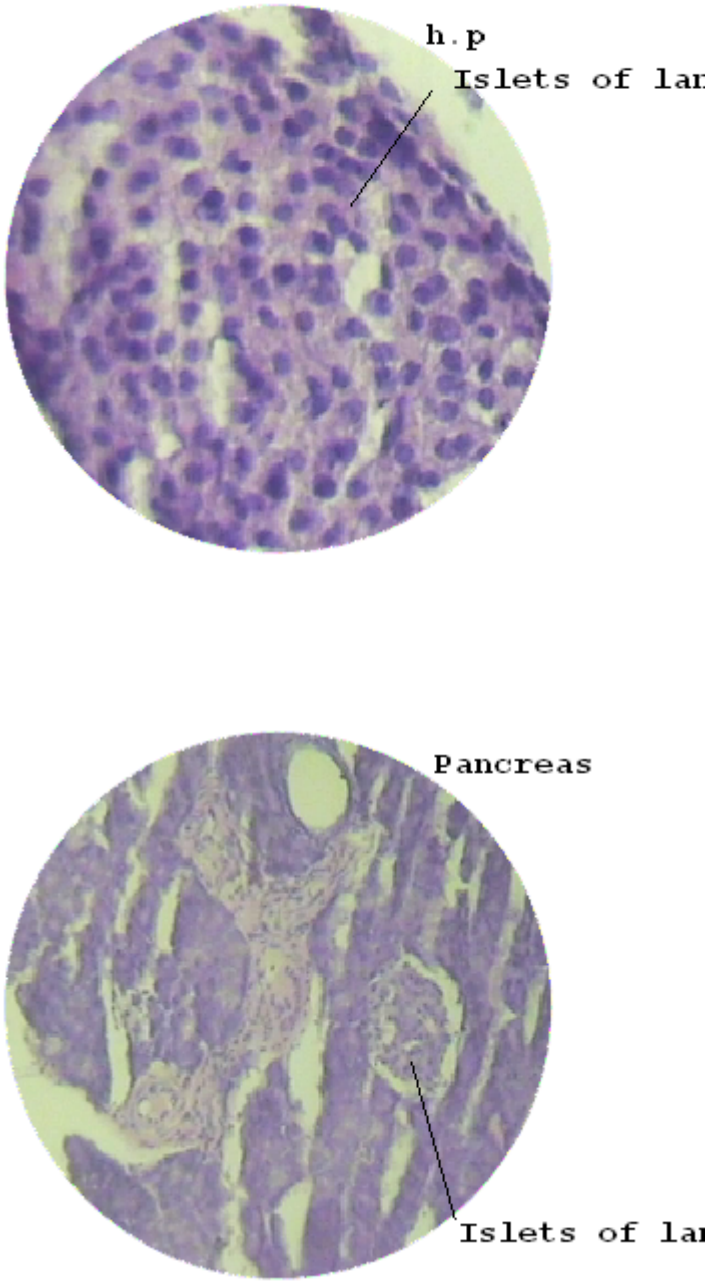
G4- Treatment group 200mg/kg; **G5**- Treatment group 400mg/kg.

- Values are expressed as Mean ± SEM.
- Values were find out by using ONE WAY ANOVA followed by Newman Keul's multiple range tests.
- Values were not significantly different from normal and diabetic control.

HISTOPATHOLOGY STUDY OF PANCREAS OF RATS

Group I: Normal Control (Saline)

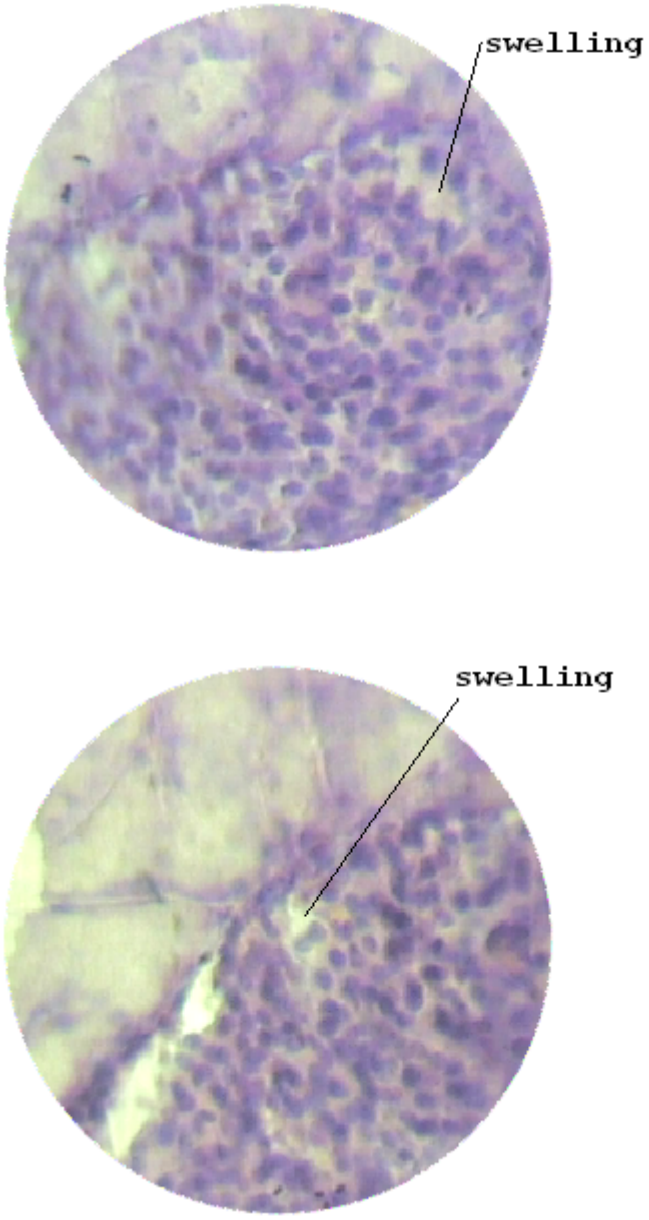
Figure No: 1



The normal numbers and volume of the islets cells.

Group II: Toxic Control (Alloxan monohydrate)

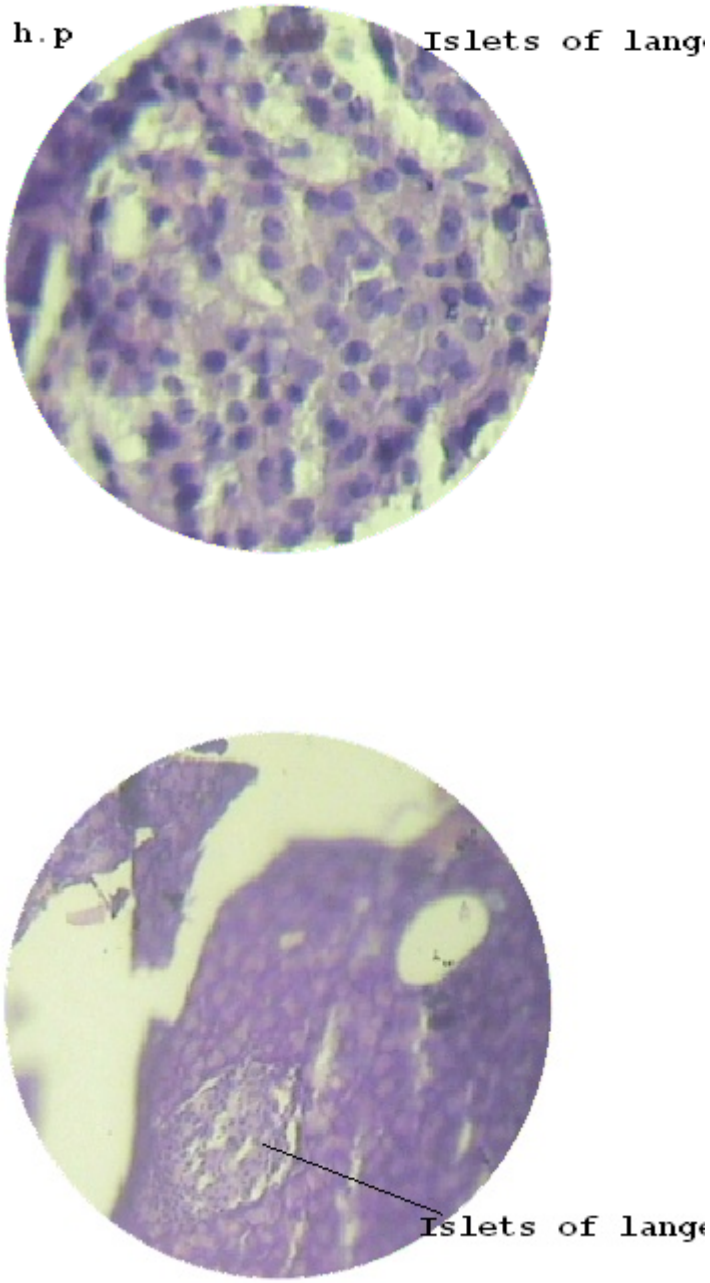
Figure No: 2



The numbers of islets cells were significantly decreased, islets cells were severely swelled.

Group III: Positive Control (Alloxan monohydrate + Glipizide)

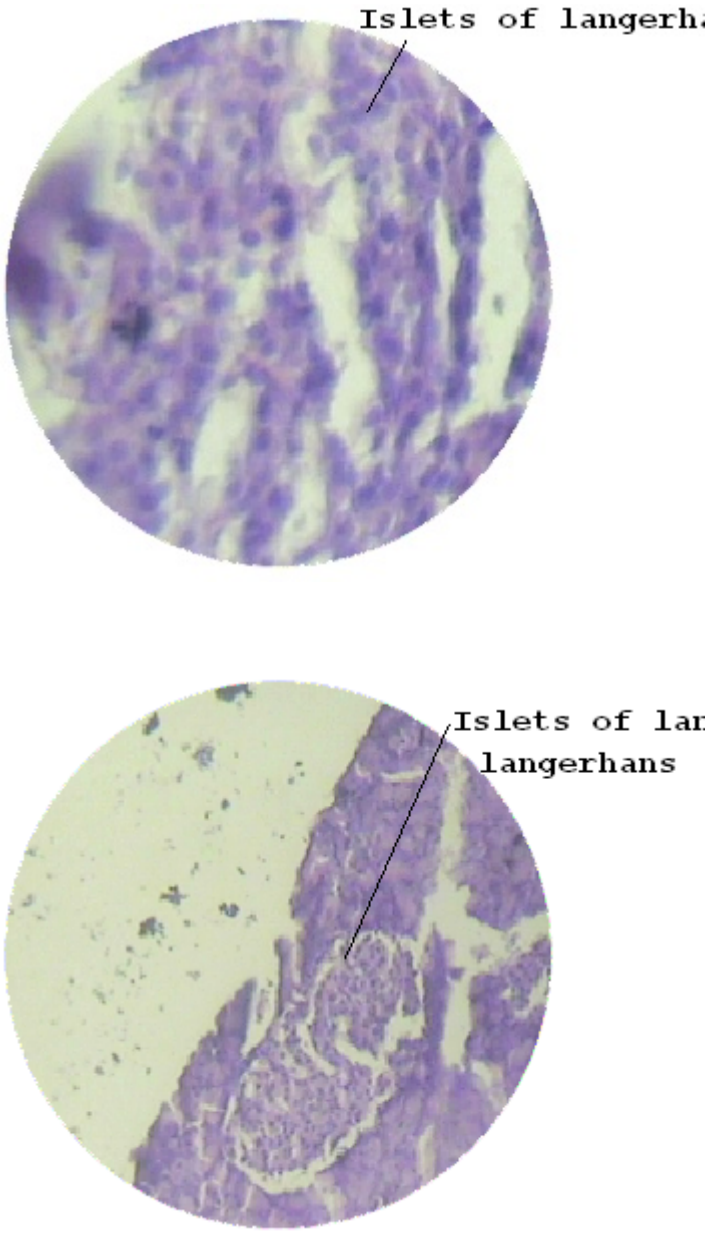
Figure No: 3



The numbers of islets cells were moderatly decreased, islets cells were mildly swelled.

Group IV: Treatment group (Alloxan monohydrate + Neerizhivu chooranam 200mg/kg)

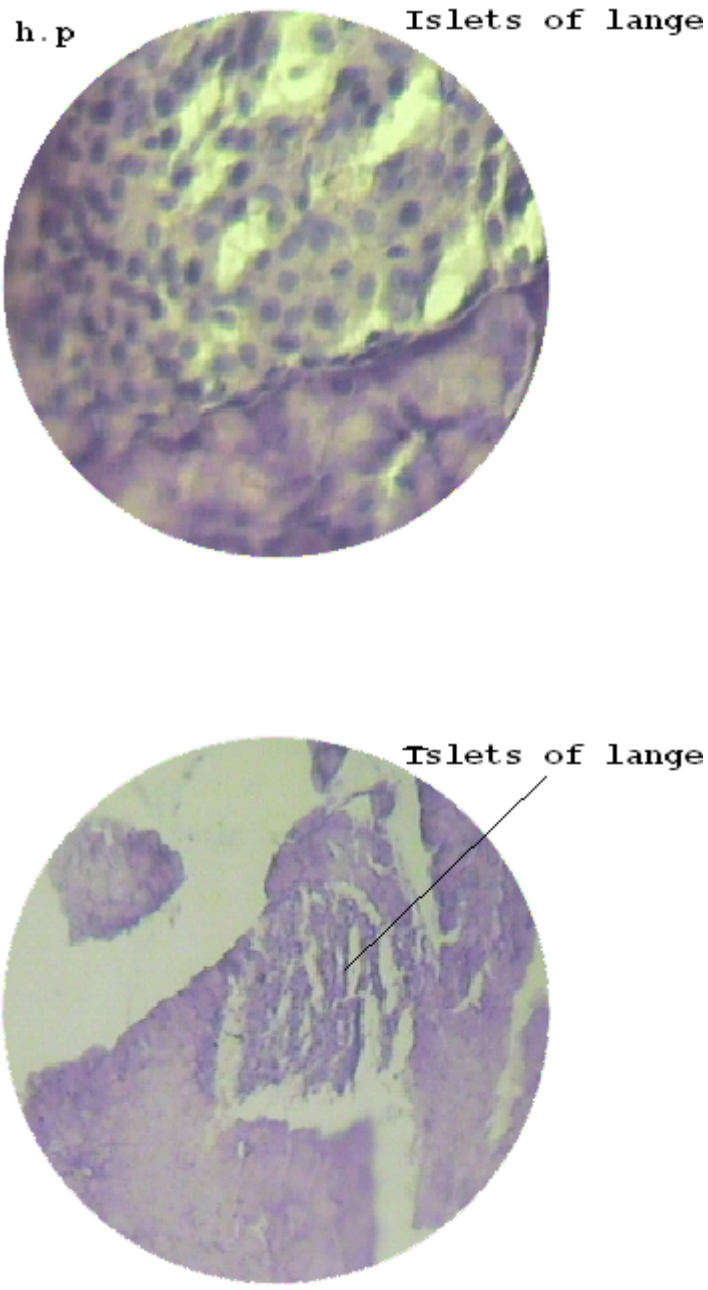
Figure No: 4



The numbers of islets cells were moderate decreased, islets cells were moderate swelled.

Group V: Treatment group (Alloxan monohydrate + Neerizhivu chooranam 400mg/kg)

Figure No: 5



The numbers of islets cells were moderate decreased, islets cells were moderate swelled.

RESULTS

Table No-1 shows the values of body weight of normal and experimental animals in each group. The mean body weight of diabetic rats (150.45 ±2.10) was significantly decreases as compared to normal animals (216.30 ± 4.58).

The body weight of diabetic rats treated with Neerizhivu chooranam at different doses 200 mg/kg & 400 mg/kg was significantly increased to 226.30 ± 4.56 & 220.60 ± 4.23 respectively as compared to non-treated diabetic animals. In group III treated animals also showed an increase in body weight significantly as compared to diabetic rats.

EFFECT OF NEERIZHIVU CHOORANAM ON BLOOD GLUCOSE LEVELS

In all groups prior to alloxan administration the basal level of plasma glucose of the rats were not significantly higher in the rats selected for the study. In contrast non-diabetic control remained steadily euglycemic throughout the course of study.

In pilot study (mild diabetics) the **Table No-2** values show the effect of treatment of various doses of Neerizhivu chooranam at a dose of 200 mg/kg & 400mg/kg respectively on plasma glucose levels. Blood glucose level was increased significantly to 172.20 ± 6.30 & 216.6 ± 7.28 at 14^{th}& 28^{th} day of treatment respectively, in the diabetic animals as compared to normal animals.

In the Neerizhivu chooranam treated groups (both doses), significant anti-hyperglycemic ($p<0.001$) effect was evident from the 2^{nd} week onwards, the decrease in blood sugar was maximum on completion of the 4^{th} week in the group receiving 200 mg/kg & 400mg/kg of Neerizhivu chooranam respectively, where as in group III treated animals

receiving glipizide at a dose of 10mg/kg also restored the blood sugar level near to normal range.

EFFECT OF NEERIZHIVU CHOORANAM ON GLYCOGEN CONTENT

Glycogen content of liver tissue was estimated on the 28th day in non-diabetic control, diabetic control, treated group and positive control group as shown in **Table No-3**. In diabetic control liver glycogen content decreased significantly by 94.6 % as compared to non-diabetic control. Treatment with glipizide, Neerizhivu chooranam at two doses (200mg/kg & 400mg/kg) led to 73.39 %, 63.75 % and 67.33% increase in liver glycogen content in comparison to diabetic control.

EFFECT OF NEERIZHIVU CHOORANAM ON HEPATIC ENZYMES

To establish diabetic, plasma glucose was determine 72hrs after alloxan administration. Only those rats with over 180 mg% were included in the study. On the 28th day, hepatic enzymes Hexokinase & Glucokinase and substrate Glucose-6-phosphate were estimated in saline controls (group I), diabetic control (group II), and treatment controls (groups III, IV, V).

The result has been compiled in **Table No-4**. As compared to non-diabetic control values, mean level of enzymes Hexokinase & Glucokinase and substrate Glucose-6-phosphate values decreased in diabetic control. The respective percentage decrease was 56.19%, 79.96% and 67.69% in diabetic control. Treatment with Neerizhivu chooranam at two doses (200mg/kg & 400mg/kg) for 28 days led to rise in percentage of these parameter by 28.26% & 82.53%, 127.45% & 34.28%,, 47.5%, 67.78% respectively ($P<0.001$) as compared to diabetic control. Also treatment with glipizide 10mg/kg for 28 days led to rise in percentage of

these parameters by 38.04%, 138.09% and 188.93% respectively (P< 0.001) as compared to diabetic control.

EFFECT OF NEERIZHIVU CHOORANAM ON HAEMATOLOGICAL PARAMETERS

Table No: 5 values shows the haematological parameters of group I to group V treated animals. At the end of 28 days of the study period, no statistically significant differences were seen in the mean WBC and RBC counts, HB & Platelet values as compared to the non-diabetic animals.

HISTOPATHOLOGICAL STUDY

In histopathological study, the **Figure-1** showed normal acini and normal cellular population in the islets of langerhans in pancreas of non-diabetic rats (group-I). **Figure-2** showed extensive damage and reduced number of islets of langerhans in pancreas of diabetic rats (group-II). **Figure-3** showed restoration of normal cellular population size of islets with hyperplasia by glipizide (group-III). **Figure-4 &5** showed partial restoration of normal cellular population and enlarged size of β-cells with hyperplasia in Neerizhivu chooranam treated groups (group IV & group V).

DISCUSSION

Currently available drug regimens for the management of diabetes mellitus have certain drawbacks [9] and therefore, there is a need for safer and more effective antidiabetic drugs. This study was therefore undertaken to assess anti-hyperglycemic property of Neerizhivu chooranam which have been reported in siddha to be useful in diabetes mellitus.

In the current study diabetes mellitus was induced by alloxan monohydrate at a dose of 150 mg/kg i.p. Alloxan causes enormous reduction in insulin release through the destruction of β cells of the islets of langerhans. The mechanism of alloxan action was completely

described elsewhere.[10,11] In our study we have observed a significant increase in plasma glucose level in alloxan induced diabetic rats, whereas treatment with glipizide (10mg/kg), Neerizhivu chooranam at two different doses (200mg/kg & 400mg/kg) showed significant antihyperglycemic activity in mild degree of hyperglycemia. In mild diabetes, the maximum percent reduction in glucose level was seen in groups receiving 400mg/kg per day of Neerizhivu chooranam. This could be due to potentiation of insulin effect of plasma by increasing their pancreatic secretion of insulin from existing β-cells of islets of langerhans or its release from bound insulin. The significant and consistent antidiabetic effect of Neerizhivu chooranam in alloxan-induced diabetic rats in also is due to enhanced glucose utilization by peripheral tissues. The above finding is correlated with an earlier study, which reported that the water extract of dried fruits of Terminalia chebula[12] improves glucose tolerance and bring down fasting blood glucose in diabetic rats.

The body weights were decreased in alloxan-induced diabetic rats. [13]Administration of Neerizhivu chooranam at two doses increased body weight in alloxan-induced diabetic rats. The ability of Neerizhivu chooranam to protect massive body weight loss seems to be due to its ability to reduce hyperglycemia.

As reported earlier,[14] in the current study the liver glycogen content was reduced significantly in diabetic control as compared to non-diabetic control. Treatment with Neerizhivu chooranam at two doses prevented this alteration in glycogen content of liver tissue. But could not normalize the content of glycogen of the non-diabetic control. This prevention of depletion of glycogen in liver is possibly due to either stimulation of insulin release from β-cells [15] or due to the insulinomimetic activity of some components of the plants resulting in direct peripheral glucose uptake.

Decreased enzymatic activity of hexokinase, glucokinase and substrate glucose-6- phospate has been reported in diabetic animals resulting in depletion of liver and muscle glycogen.[16]The present study also had similar results. Treatment with Neerizhivu chooranam significantly increased the hexokinase & glucokinase activity and glucose-6-phosphate level in the liver, indicating an overall increase in glucose influx thus Neerizhivu chooranam seems to have an overall effect in increase in glucose utilization. Studies also assess this plant extract showed no adverse effect on haematological parameters including WBC and RBC counts, HB, Platelets. Thus this Neerizhivu chooranam can be presumed to be free from toxicological effects.

Histopathological studies revealed that Neerizhivu chooranam and Glipizide significantly improved the histological architecture of the islets of langerhans. The groups treated with Neerizhivu chooranam (200mg/kg & 400mg/kg) and glipizide (10mg/kg) showed greater persistence of islets of langerhans & lesser degree of necrotic changes as compared to the untreated alloxan-induced diabetic rats.

CONCLUSION

The Neerizhivu chooranam did not show a consistent effect on normal blood sugar levels, but it effectively reversed the Alloxan induced changes in the blood sugar level and β-cell population in the pancreas. It also showed a protective effect when it was given earlier to alloxan administration. The action of Neerizhivu chooranam on the pancreatic β-cells and the absence of toxicity may offer a new hope to the diabetes in future.

From the above discussion it concluded that the Neerizhivu chooranam at high dose (400mg/kg) & low dose (200mg/kg) exhibited significant anti-hyperglycemic activity. This Neerizhivu chooranam also showed improvement in the parameters like body weight, liver glycogen

content and carbohydrate metabolizing enzymes, as well as regeneration of β-cells of pancreas and so might be of value in diabetes treatment.

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,
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FORM-I

(SCREENING AND SELECTION PROFORMA)

1.Name_____ 2.Age_____3.gender_____4.Phone no _____

5. OP No. ———————— 6. IP No. ———————— 7. S.No. ————————

. **INCLUSION CRITERIA:**

- Age 35-65 yrs
- Polyuria
- Polydipsia
- Polyphagia
- Constipation
- Weight loss
- General tiredness, Burning feet, generalized/genital pruritus, , tingling and numbness, delayed/non-healing wounds/ulcer,.
- Hyperglycemia (Blood glucose level ≥ 125 mg/dl in fasting, ≥ 170 mg/dl in postprandial).
- Patient willing to sign the informed consent stating that he will conscientiously stick to the treatment during 20 days but can opt out of the trial of his own conscious discretion.
- Patients who are willing to provide blood and urine for lab investigation.

EXCLUSION CRITERIA:

- Diabetic complications like neuropathy, retinopathy, etc.
- Hypertension
- Heart disease
- Kidney disease
- Liver diseases
- Pancreatic disease like acute pancreatitis, carcinoma of pancreas etc…
- Gestational diabetes
- Pregnancy and Lactation

- ❖ Patient not willing to give blood sample

DATE:

STATION

SIGNATURE OF HOD

SIGNATURE OF INVESTIGATOR

SIGNATURE OF LECTURER

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FORM I A -

HISTORY PROFORMA ON ENROLLMENT

1. Serial No of the case: _____ 2. OP/IP No:----------

3. Name: _____ 4. Gender: Female/male

5. Age (years): _____ DOB ☐☐ ☐☐ ☐☐☐☐

Date Month Year

6.Address:----------

7.A.Occupation: ---------- B. Nature of work----------

---

8. Educational Status: A) Illiterate ☐ B)Literate ☐

9.Height: cms 10.Weight: kg

11. Complaints and Duration:

_____

_____

_____

---

12. Habit of

A) Smoking 1. Yes; duration _____ years; Number- …. 2. No

B) Alcoholism 1. Yes; duration _____ years; Quantity- . ... ml 2. No

C) Tobacco chewing 1. Yes; duration _____ years 2.No

D) Betel chewing 1. Yes; duration _____ years 2.No

13.Dietary style: A.Pure vegetarian B.Non-vegetarian C. C. Mixed diet

14. Drug History: Had the patient been treated before with allopathy drug?

A) Yes ☐ 2) No ☐

15 MARITAL STATUS 1.Married 2.Unmarried

16. FAMILY HISTORY

Whether this problem runs in family? 1. Yes ☐ 2.No ☐

If yes, mention the relationship of affected person(s) - ----------
---

17. MENSTRUAL HISTORY:

18. BOWEL HABITS & MICTURITION: **Normal** ☐

History of habitual constipation 1.Yes ☐ 2.No ☐

History of frequent diarrhoea 1.Yes ☐ 2.No ☐

History of frequent dysuria 1.Yes ☐ 2.No ☐

19. PSYCHOLOGICAL STATE

Normal ☐ **Anxiety** ☐ **Depression** ☐

Date:

Station:

Signature of the Investigator:

Signature of the Lecturer: Signature of the HOD

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FORM II & II-A
CLINICAL ASSESSMENT ON ENROLLMENT AND ON VISITS

1. **S NO ----------**
2. **OP/IP NO ---------**
3. **NAME ---------- ----------**
4. **GENDER -------**
5. **DATE OF ASSESSMENT : ----------**

SIDDHA SYSTEM OF EXAMINATION

1. ENVAGAI THERVU: [EIGHT-FOLD EXAMINATION]

I. NAADI: [PULSE PERCEPTION]

	0st day	07th day	14th Day	21th day	28th Day	35th Day	42th Day	45th Day
Vali								
Azhal								
Iyyam								
Vali Azhal								
Azhal vali								
Iyya vali								
Vali Iyyam								
Azhal Iyyam								
Iyya Azhal								

II. NAA:[TONGUE]

	0st day	07th day	14th Day	21th day	28th Day	35th Day	42th Day	45th Day
Colour	Dark / Yellow Red / Pale	Dark/Yellow/ Red/Pale	Dark/Yellow/ Red/Pale	Dark/ Yellow/ Red/Pale	Dark/Yellow Red/Pale	Dark/ Yellow Red/Pale	Dark/ Yellow Red/Pale	Dark/ Yellow Red/Pale
Taste	Sweet/Bitter /Sour Pungent/ None	Sweet/Bitter/ Sour Pungent/None	Sweet/Bitter/ Sour Pungent/None	Sweet/Bitter/ Sour Pungent/ None	Sweet/ Bitter/ Sour Pungent/ None	Sweet/ Bitter/ Sour Pungent/ None	Sweet/ Bitter/ Sour Pungent/ None	Sweet/ Bitter/ Sour Pungent/ None
Coating	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent
Fissure	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/Absent	Present/ Absent	Present/ Absent	Present/ Absent
Saliva	Normal/ Increased/ Decreased	Normal/ Increased Decreased	Normal/ Increased/ Decreased	Normal/ Increased/ Decreased	Normal/ Increased/ Decreased	Normal/ Increased/ Decreased	Normal/ Increased/ Decreased	Normal/ Increased/ Decreased
Dryness	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/Absent	Present/ Absent	Present/ Absent	Present/ Absent
Glossitis	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/Absent	Present/ Absent	Present/ Absent	Present/ Absent
Baldness	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/Absent	Present/ Absent	Present/ Absent	Present/ Absent

III.NIRAM: [COMPLEXION]

0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Dark/ Yellow tinted/ Pale	Dark/ Yellow tinted / Pale	Dark/ Yellow tinted / Pale	Dark/ Yellow tinted / Pale	Dark/ Yellow tinted/ Pale	Dark/ Yellow tinted/ Pale	Dark/ Yellow tinted/ Pale	Dark/ Yellow tinted/ Pale

IV.MOZHI: [VOICE]

0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Medium/ High Low pitched	Medium/ High/ Low pitched	Medium/ High/ Low pitched	Medium/ High/ Low pitched	Medium/ High/ Low pitched	Medium/ High Low pitched	Medium/ High/ Low pitched	Medium/ High Low pitched

V.VIZHI: [EYES] (Lower palpabrel conjunctiva)

0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale	Dark/ Yellow Red/ Pale

VI. MALAM; [BOWEL HABITS / STOOLS]

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Colour	Dark/ Yellow/ Red/ Pale	Dark/ Yellow/ Red/Pale	Dark/ Yellow/ Red/ Pale	Dark/ Yellow/ Red/Pale	Dark/ Yellow/ Red/Pale	Dark/ Yellow/ Red/Pale	Dark/ Yellow/ Red/Pale	Dark/ Yellow/ Red/Pale
Consistency	Solid/ Semisolid Watery	Solid/ Semisolid Watery	Solid/ Semisolid Watery	Solid/ Semisolid Watery	Solid /Semisolid Watery	Solid/ Semisolid Watery	Solid/ Semisolid Watery	Solid/ Semisolid Watery
Stool bulk	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced	Normal/ Reduced
Constipation	Present/Absent	Present/ Absent	Present/ Absent	Present/Absent	Present /Absent	Present /Absent	Present /Absent	Present /Absent
Diarrhoea	Present/Absent	Present/ Absent	Present/ Absent	Present/Absent	Present /Absent	Present /Absent	Present /Absent	Present /Absent

VII. URINE EXAMINATION:

NEER KURI	0st day	07th day	14th Day	21th day	28th Day	35th Day	42th Day	45th Day
Niram [Colour]	White/ Yellowish/ Strawcoloured/ Crystal clear	White/Yellowish/ Strawcoloured Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear	White/ Yellowish/ Straw coloured/ Crystal clear
Manam [Odour]	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent	Present Absent
Nurai [Froth]	Nil Reduced /Increased	Nil Reduced/ Increased	Nil Reduced/ Increased	Nil Reduced /Increased	Nil Reduced/ Increased	Nil Reduced/ Increased	Nil Reduced/ Increased	Nil Reduced/ Increased
Edai [Sp.gra]	Normal Increased/ Reduced	Normal Increased /Reduced	Normal Increased/ Reduced	Normal Increased/ Reduced	Normal Increased/ Reduced	Normal Increased /Reduced	Normal Increased/ Reduced	Normal Increased/ Reduced
Enjal [Deposits]	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent	Present/ Absent
Volume	Normal Increased/ Reduced	Normal Increased /Reduced	Normal Increased/Reduced	Normal Increased/Reduced	Normal Increased/Reduced	Normal Increased/Reduced	Normal Increased/Reduced	Normal Increased /Reduced

NEIKURI	**0st day**	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Serpentine fashion								
Annular/Ringed fashion								
Pearl beaded fashion								
Mixed fashion								
Other fashion								

VIII. SPARISAM: [PALPATORY PERCEPTION]

0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Warmth/Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat	Warmth/ Cold Sweat

5. THEGI: [TYPE OF BODY CONSTITUTION]

Vatham predominant		Kabam predominant	
Pitham predominant		Thondha udal	

6.NILAM: [LAND WHERE PATIENT LIVED MOST]

Kurinji ☐ (Hilly terrain) Mullai ☐ (Forest range) Marutham ☐ (Plains) Neithal ☐ (Coastal belt) Palai ☐ (Arid regions)

7. KAALAM

Kaarkalam- ☐ Pinpanikalam ☐

Koothirkalam- ☐ Ilavenil ☐

Munpanikalam - ☐ Muthuvenil ☐

8. GUNAM

Sathuvam ☐ Rasatham ☐ Thamasam ☐

9. IMPORIGAL (SENSORY ORGANS)

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Mei (Skin)								
Vai (Buccal Cavity)								
Kann (Eye)								
Sevi (Ear)								
Mooku (Nose)								

10. KANMENDRIYAM (MOTOR ORGANS)

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Kai (upper limb)								
Kaal (lower limbs)								
Vai (buccal cavity)								
Eruvai (excretory organs)								
Karuvai (reproductive organs)								

11. KOSANGAL(Sheath)

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Annamaya Kosam								
Pranamaya kosam								
Manomaya kosam								
Vignanamaya kosam								
Ananthamaya kosam								

12. MUKKUTRAM:[AFFECTION OF THREE HUMORS]

A)VATHAM:

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Praanan								
Abaanan								
Samaanan								
Udhaanan								

Viyaanan								
Naagan								
Koorman								
Kirukaran								
Devathathan								
Dhananjeya								

B) PITHAM:

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Analapitham								
Prasakam								
Ranjakam								
Aalosakam								
Saathakam								

C) KABAM:

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Avalambagam								
Kilethagam								
Pothagam								
Tharpagam								
Santhigam								

13. SEVEN DHATHUS: (7 SOMATIC COMPONENTS)

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Saaram[Chyme]								
Senneer[Blood]								
Oon[Muscle]								
Kozhuppu[Fat]								
Enbu[Bones]								
Moolai [Bonemarrow]								
Sukkilam/Suronitham [Genital discharges]								

14. SYSTEMIC EXAMINATION:

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
LOCOMOTOR SYSTEM								
CARDIO VASCULAR SYSTEM								
RESPIRATORY SYSTEM								
GASTRO INTESTINAL SYSTEM								
CENTRAL NERVOUS SYSTEM								
UROGENITAL SYSTEM								
ENDOCRINE SYSTEM								

15. GENERAL EXAMINATION:

	0st day	**07th day**	**14th Day**	**21th day**	**28th Day**	**35th Day**	**42th Day**	**45th Day**
Height (cms)								
Weight (kg)								
Temperature(°F)								
Pulse rate (pe rmin)								

Heart rate (per min)								
Respiratoryrate(permin)								
Blood pressure(mm/Hg)								
Pallor								
Jaundice								
Cyanosis								
Lymphadenopathy								
Pedal edema								
Clubbing								
Jugular vein pulsation								

16. CLINICAL SYMPTOMS

S.NO	CLINICAL SYMPTOMS	0st day	07th day	14th Day	21th day	28th Day	35th Day	42th Day	45th Day
1.	POLY UREA								
2.	Polydypsia								
3.	Polyphagia								
4.	Nocturia								
5.	Tiredness								
6.	Pain in the limbs								
7.	Pain &burning sensation in the both sole								
8.	Parasthesia in the feet								
9.	Pruritis vulvae								
10.	Balanitis								
11	Asymptomatic								

Date :

Station:

Signature of the Investigator:

Signature of the Lecturer: Signature of the HOD

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,
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FORM III
LABORATORY PARAMETERS-CHART

1. O.P.No / I.P.No: _____
2. Bed No: _____
3.. S.No: _____
4. Name: _____
5. Age (years): _____
6. Gender: M ☐ F ☐

LAB INVESTIGATION CHART

BLOOD INVESTIGATION		**NORMAL VALUES**	**BEFORE TMT (with date)**	**AFTER TMT(WITH DATE)**
HB(gms%)		**M:12-15 W:11.5-14**		
T.RBC(milli/cu.mm)		**M:4.0-5.5 W:3.5-4.5**		
	½ hr.	**-**		

ESR (mm /hr)	**1 hr.**	**M:6-12 W:7-18**		
T.WBC(cells /cu.mm)		**4000-10000**		
DIFFERENTIAL COUNT (%)	**Polymorphs**	**40-75**		
	Lymphocutes	**20-40**		
	Monocytes	**2-10**		
	Esonophils	**1-6**		
	Basophiles	**0-1**		
Blood group				
Rh type				

Blood Investigation		**Normal Values**	**Before TMT(with Date)**	**After TMT (With Date)**
Platelets ;(lak/ cubic mm)		**1,50000-500000**		
Blood glucose (mg/dl)	**Fasting**	**70-110**		
	PP	**80-140**		
	Random	**80-120**		
Lipid profile (mg/dl)	**Serum cholesterol**	**150-200**		
	HDL	**30-63**		
	LDL	**Upto 130**		
	VLDL	**40**		
	TGL	**Upto 160**		
RFT (mg/dl)	**Blood urea**	**16-50**		
	Serum creatinine	**0.6-1.2**		
	Serum Uric acid	**M:3-9 W: 2.5-7.5**		
LFT (mg/dl)	**Total bilirubin**	**0.2-1.2**		
	Direct bilirubin	**0.1-1.2**		

	Indirect bilirubin	**0.2-0.7**		
	Serum total protein	**6-8**		
	Serum Albumin	**3.5-5.5**		
	Serum globulin	**2-3.6**		
	Fibrinogen(g/dl)	**0.2-0.4**		
	Serum calcium	**8.5-10.5**		
	Serum phosphorous	**3-4.5**		
	SGOT (IU/L)	**0-40**		
	SGPT (IU/l)	**0-35**		
	Alkaline phosphatase (kingÅ units)	**80-290**		

Urine investigation	**Before TMT(with Date)**	**After TMT (With Date)**
Neer kuri		
Niram		
Manam		
Nurai		
Edai		
Enjal		
Nei kuri :-		
Albumin		
Sugar(F)		
Sugar(PP)		
Sugar(R)		
Deposits		

Bile salts		
Bile pigments		
Urobilinogen		

Date:

Station:

SIGNATURE OF INVESTIGATOR SIGNATURE OF HOD

SIGNATURE OF LECTURER

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,
PALAYAMKOTTAI, TIRUNELVELI DISTRICT
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FORM IV
PATIENT INFORMATION SHEET

- It is a Hereditary disease.
- This disease is not contagious.
- It is a clinical syndrome occurs due to deficiency of Insulin secretion.
- Many herbal and mineral siddha medicines are currently practiced by the siddha practioners for Diabetes mellitus.
- The trial drug is recommended for this disease, specially by the Doctors of GSMC.
- The trial drug is prepared at the Gunapadam lab of government siddha medical college & hospital,palayamkottai, under the direct supervision of teaching faculties of Maruthuvam and Gunapadam.

Details of the trial drug:

1. . **NEERIZHIVU CHOORANAM**

DOSAGE : 2gm, two times a day; after food
ADJUVANT : Butter milk
Duration : 45 days .

- ❖ Patients are advised to addup green vegetables, , greens , protein foods, fibre foods, wheat .Patients must walk 30-45 minutes per day
- ❖ Patients are advised to avoid tamarind, betel chewing, tobacco , alcohol and smoking.

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CONSENT FORM-IV A

Certificate by Investigator I certify that I have disclosed all details about the study in the terms readily understood by the patient.

Date: …….. Signature: …….

Name: ……..

Consent by Patient

I have been informed to my satisfaction, by the attending physician, the purpose of the clinical trial, and the nature of drug treatment and follow-up including the laboratory investigations to be performed to monitor and safeguard my body functions.

I am aware of my right to opt out of the trial at any time during the course of the trial without having to give the reasons for doing so.

I, exercising my free power of choice, hereby give my consent to be included

As a subject in the clinical trial of **NEERIZIVHU CHOORANAM for the management of MADHUMEGAM (DIABETES MELLITUS)**

.

Date: …….. Signature:

……

Name: ……..

Date: ……. Signature of Witness: ……

Name…….. ……

Relationship: ……

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,
PALAYAMKOTTAI, TIRUNELVELI DISTRICT
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FORM IV B

DIETARY ADVICE FORM

DIET ADVICE:

- Avoid sweets, fruits, tubers, ghee, milk, oily foods, non-vegetarian foods, alcohol, smoking, tobacco, betel nut.
- Take tender fresh vegetables, fiber content vegetables, greens, butter milk and take bitter gourd, ivy gourd, plantain flower weekly twice.
- Brish walking for 45 minutes daily.

Kelvaragu (Raagi)	Thuthuvalai (Climbing Brinjal)
Sirukeerai (Amaranthus)	peerkku (Ridged gourad)
Murungai Poo	Eraal
Gothumai (Wheat)	Athipinchu (Cluster fig)
Ponnanganni (Sessile plant)	Venthayam (Greek hayes)
Pagal (Bitter gourad)	Murungai (House radish)
Pudal (Snake gourad)	Ellu (Gingelly)
Avarai (The tanners cassia)	Sirupayaru (Green gram)

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,

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FORM IV C

WITHDRAWAL FORM

Name: _____ OPD/ IPD number: _____

Age: _____

Date of trial commencement: _____

Date of withdrawal from trial: _____

Reasons for withdrawal:

- Long absence at reporting : Yes/ No
- Irregular treatment: Yes/ No
- Shift of locality : Yes/No
- Increase in severity of symptoms: Yes/No
- Development of severe adverse drug reactions: Yes/No

Date:

SIGNATURE OF INVESTIGATOR SIGNATURE OF HOD

SIGNATURE OF LECTURER

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,

PALAYAMKOTTAI, TIRUNELVELI DISTRICT

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FORM IV D

ADVERSE DRUG REACTION FORM

Name: _____ OPD/ IPD number: _____

Age: _____

Date of trial commencement: _____

Date of withdrawal from trial: _____

Description of adverse reaction:

Date:

Station:

SIGNATURE OF INVESTIGATOR SIGNATURE OF HOD

SIGNATURE OF LECTURER

GOVERNMENT SIDDHA MEDICAL COLLEGE & HOSPITAL,

PALAYAMKOTTAI, TIRUNELVELI DISTRICT

DEPARTMENT OF MARUTHUVAM

PRECLINICAL AND PHASE – II RANDOMIZED OPEN CLINICAL STUDY ON MADHUMEGAM (TYPE 2 DIABETES MELLITUS) WITH NEERIZHIVU CHOORANAM

FORM IV –E

(DRUG COMPLIANCE FORM)

Name:	**Age / sex**	**Serial no**
OPD/IPD No	**Date**	**Bed no**

Name Of The Drug : NEERIZIVHU CHOORANAM

Drugs issued date:

Drugs returned date

S.NO	**DATE**	**DRUG TAKEN TIME**	
		MORNING/TIME	**EVENING/TIME**
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Day 8			
Day 9			
Day 12			

		MORNING/TIME	EVENING/TIME
Day13			
Day14			
Day15			
Day16			
Day17			
Day18			
Day19			
Day20			
Day21			
Day22			
Day23			
Day24			
Day25			
Day26			
Day27			
Day28			
Day29			
Day30			
Day31			
Day32			
Day33			
Day34			
Day35			
Day36			
Day37			
Day38			
Day39			
Day40			
Day41			
Day42			
Day43			

Day44			
Day45			

Date

Station

SIGNATURE OF INVESTIGATOR SIGNATURE OF HOD

SIGNATURE OF LECTURER

BIBLIOGRAPHY

SIDDHA LITERATURES

Agasthiyar vaidya kaviyam 1500

Agasthiyar ayul vedam 1200

Agasthiyar kanma kandam 300

Agasthiyar gurunaadi

Athamaratsamirtham @ vaithyasara sankarakam

Yugivaidya chinthamani 800

Noinadal Vol i&ii – Dr.M.Shanmugavelu

Sitha Maruthuvam – Kuppusamy mudhaliyar

Udal thathuvam I & II– Dr.Venugopal

Therayar Neerkuri and neikkuri

Noigalukku siddha parikaram – Dr.M.Shanmugavelu

Noyillaa neri –Dr.K.Durai raasan

Therayar karisal

Therayar vagadam

Guna padam – Mooligai .S.Murugesa muthaliyar

Yugimuni vaidya kaviyam

Materia medica – Nadkarni I &II

T.V.Sambashivam pillai dictionary

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Sarabendra Vaidhya Muraigal – Neerizhivu Cgitchai – Dr. S. Venkatarajan

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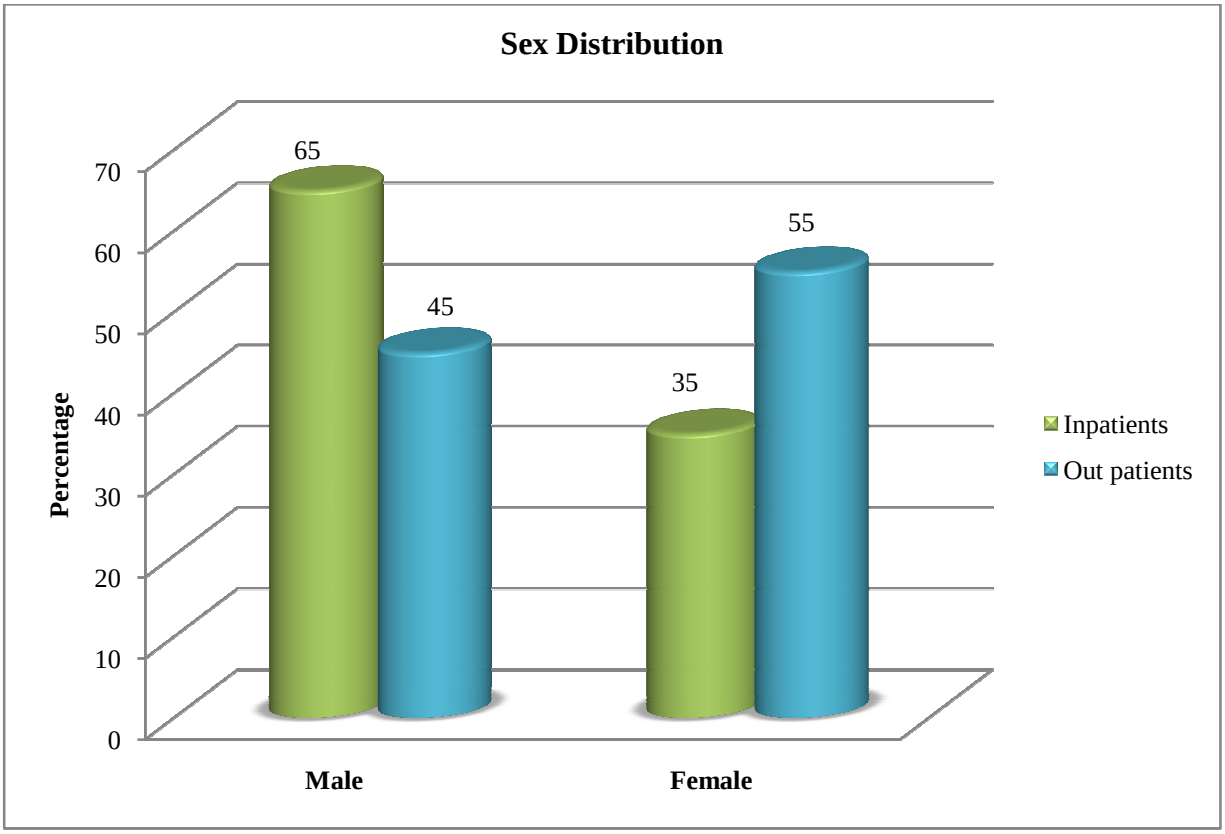
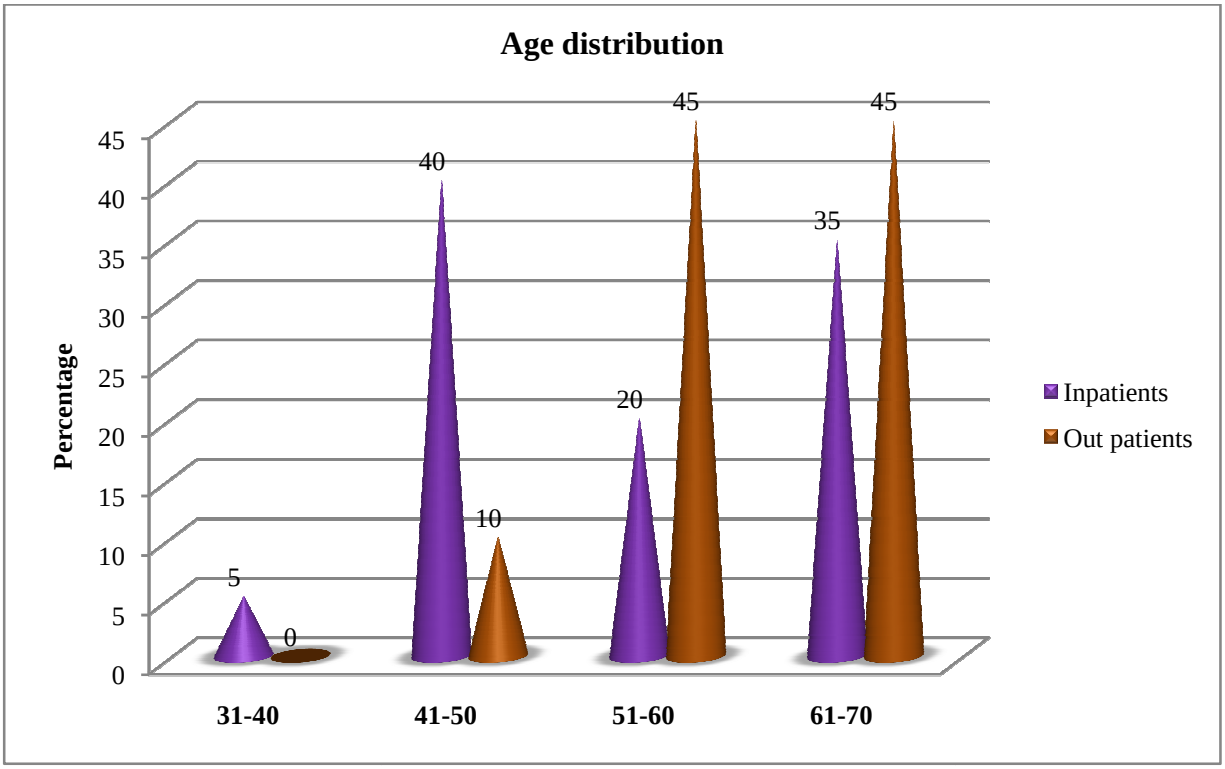
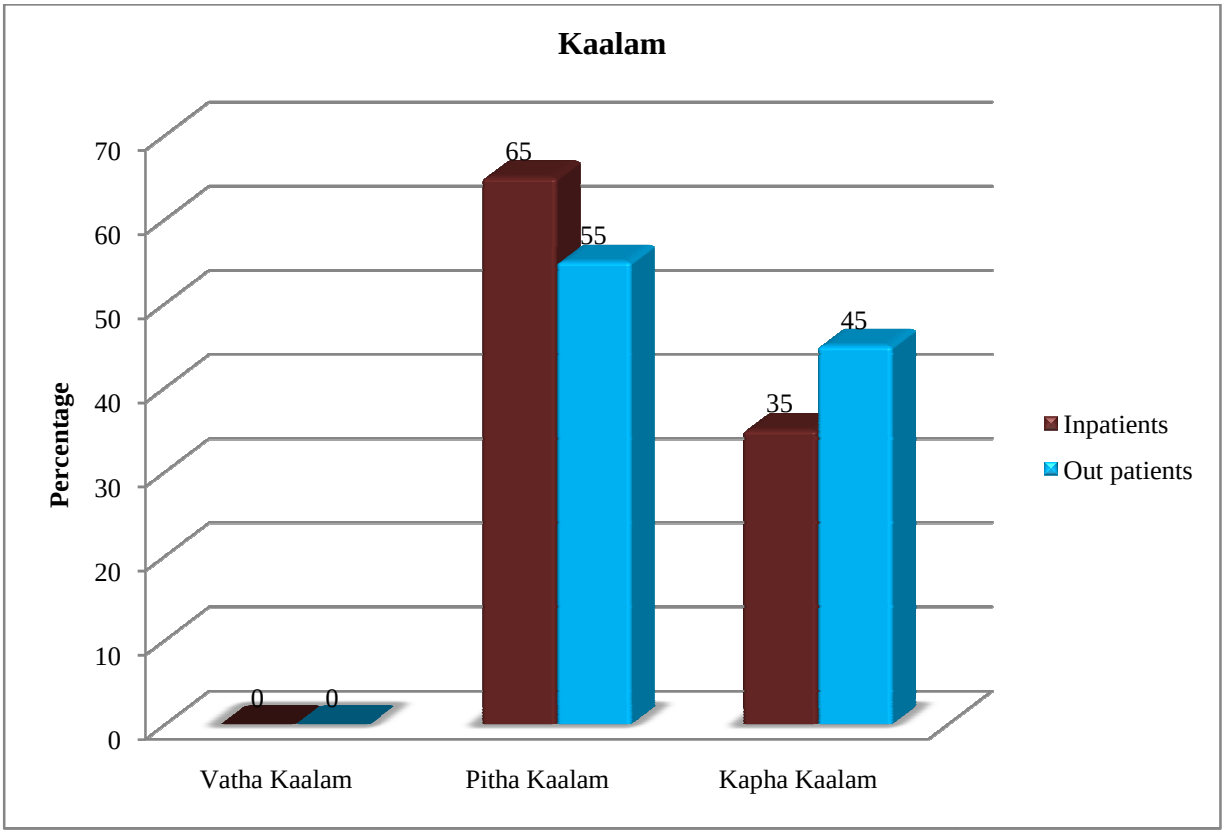
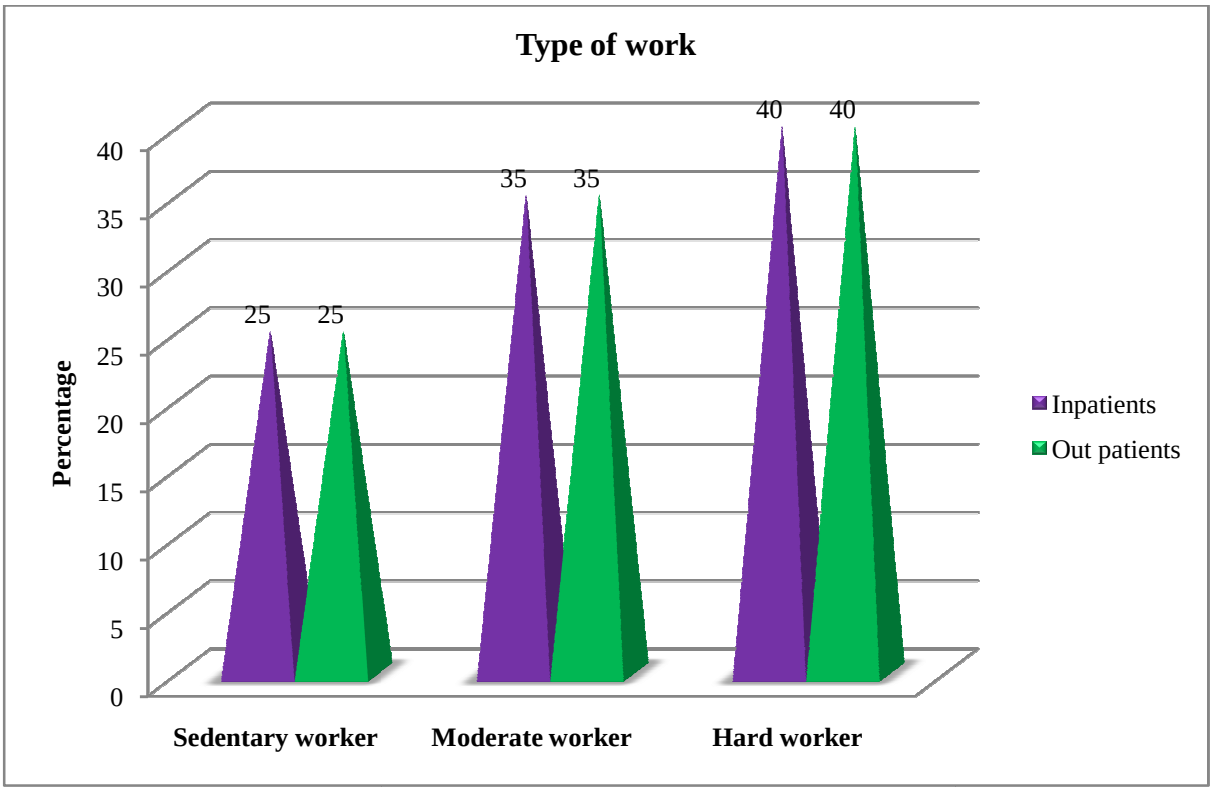
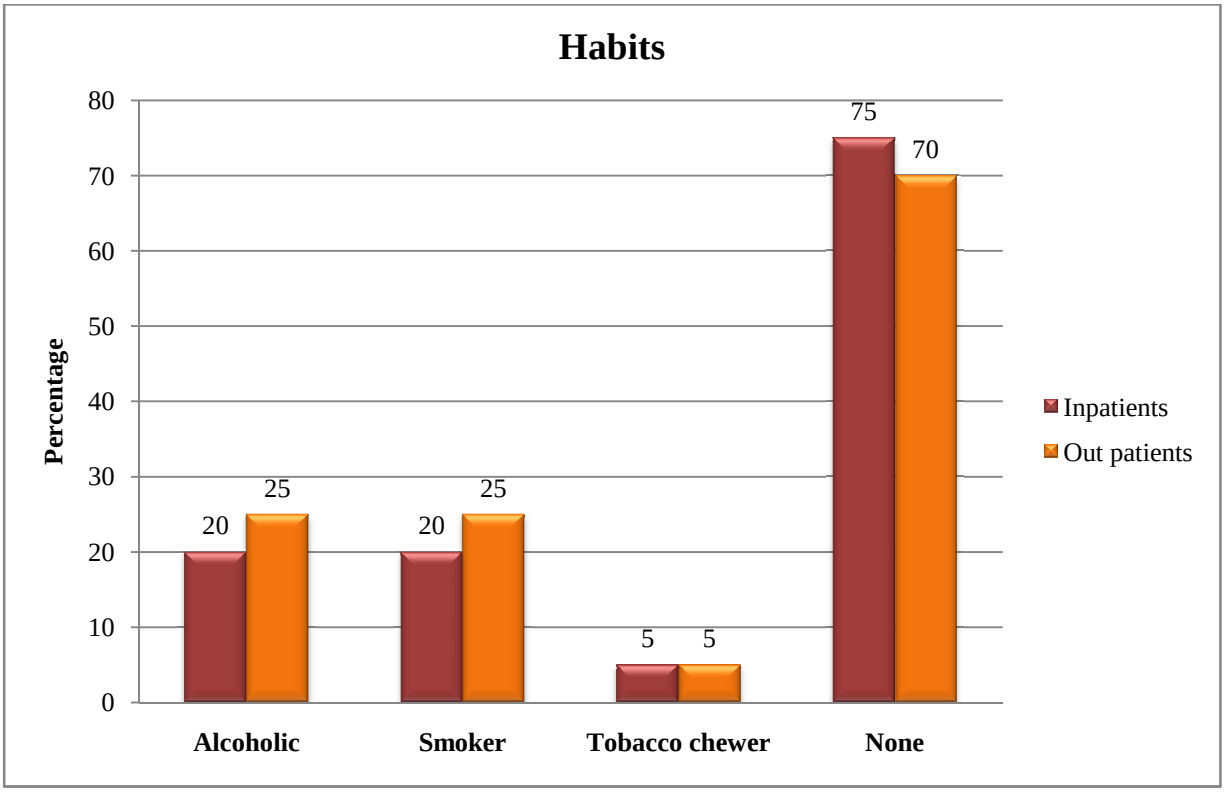
Davidson's principles and practice of medicine

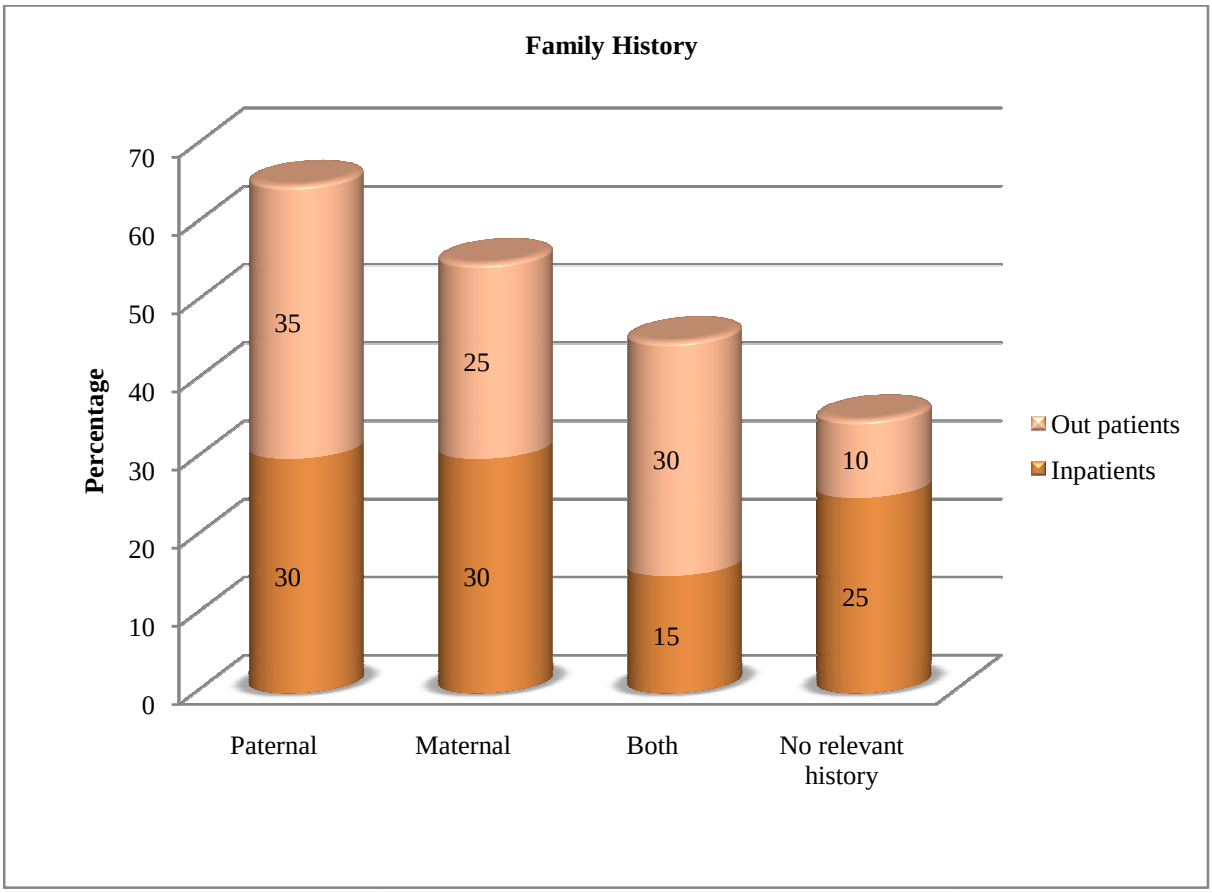

Sex Distribution
Percentage
70
60
50
40
30
20
10
0
65
45
35
55
Male
Female
Inpatients
Out patients

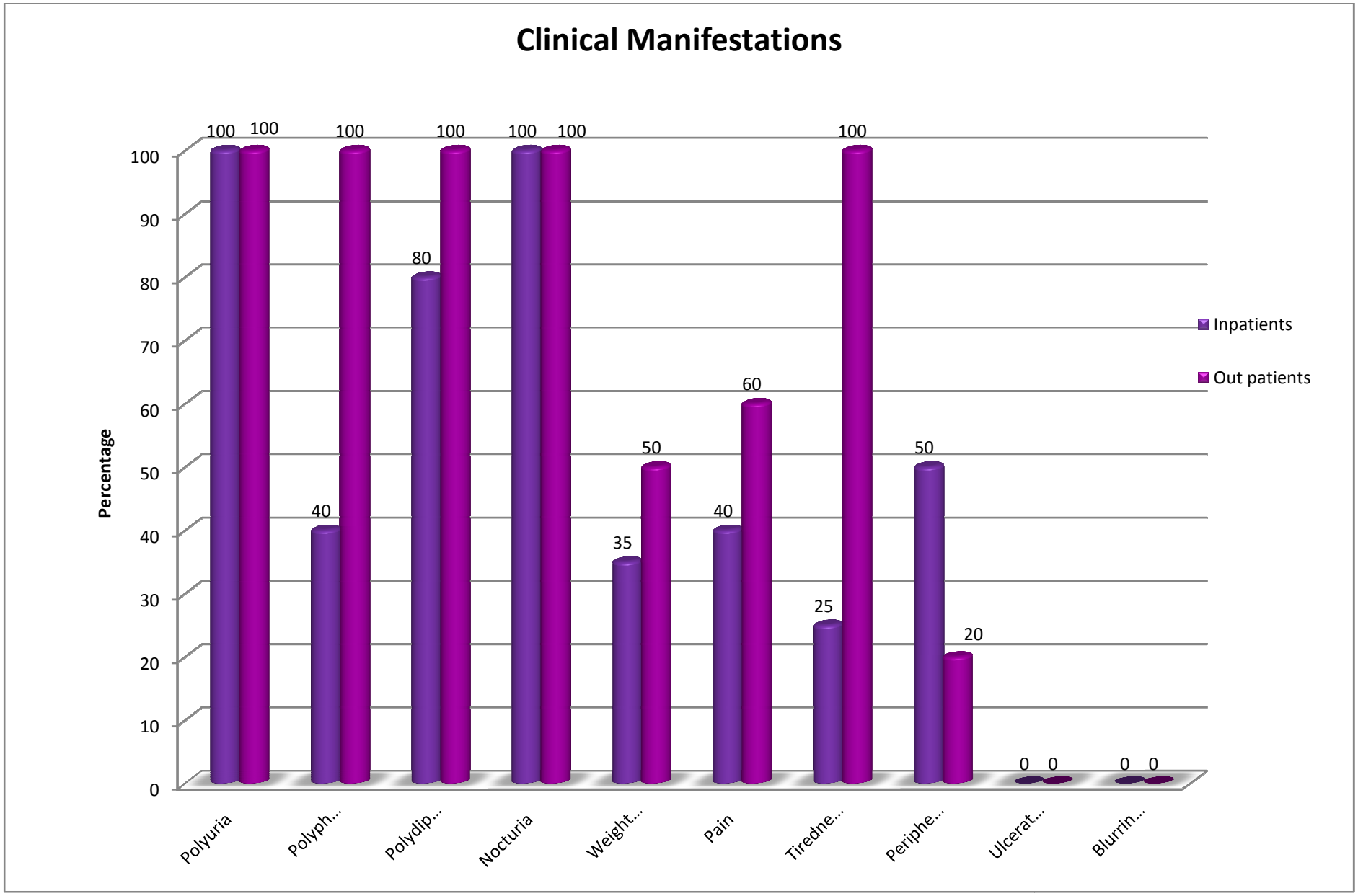

Age distribution
Percentage
45
40
35
30
25
20
15
10
5
0
5
0
40
10
20
45
35
45
31-40
41-50
51-60
61-70
Inpatients
Out patients

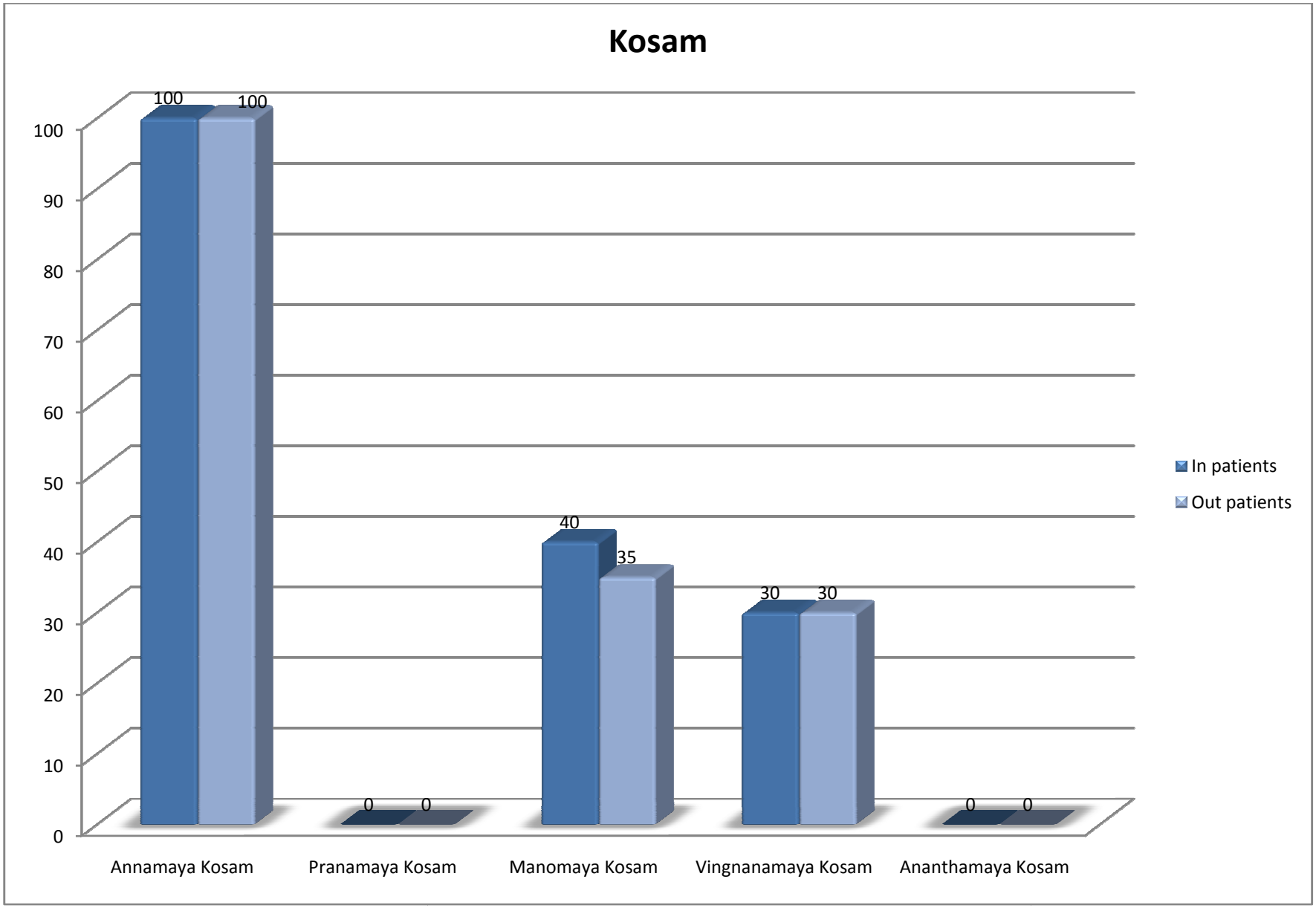

Kaalam
Percentage
70
60
50
40
30
20
10
0
65
55
45
35
0
0
Vatha Kaalam
Pitha Kaalam
Kapha Kaalam
Inpatients
Out patients

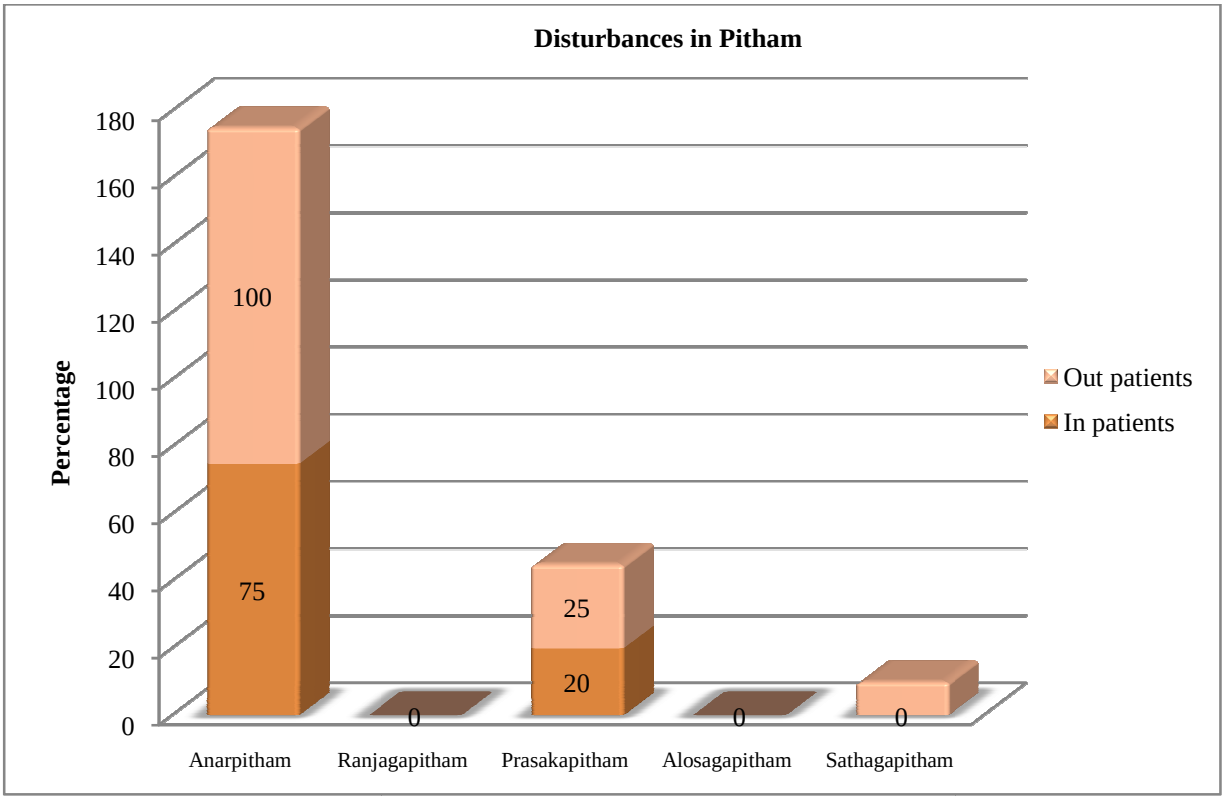

Type of work
Percentage
40
35
30
25
20
15
10
5
0
25
25
35
35
40
40
Sedentary worker
Moderate worker
Hard worker
Inpatients
Out patients

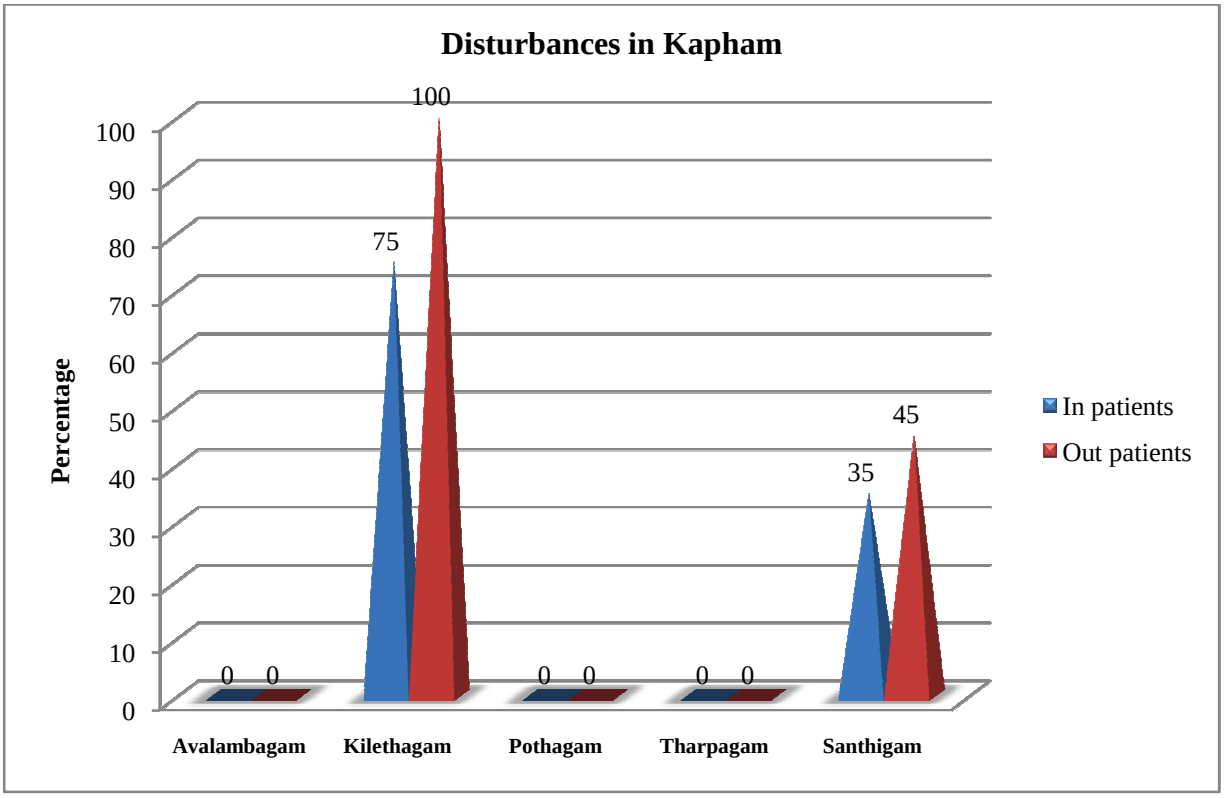

Habits
Percentage
80
70
60
50
40
30
20
10
0
20
25
20
25
5
5
75
70
Alcoholic
Smoker
Tobacco chewer
None
Inpatients
Out patients

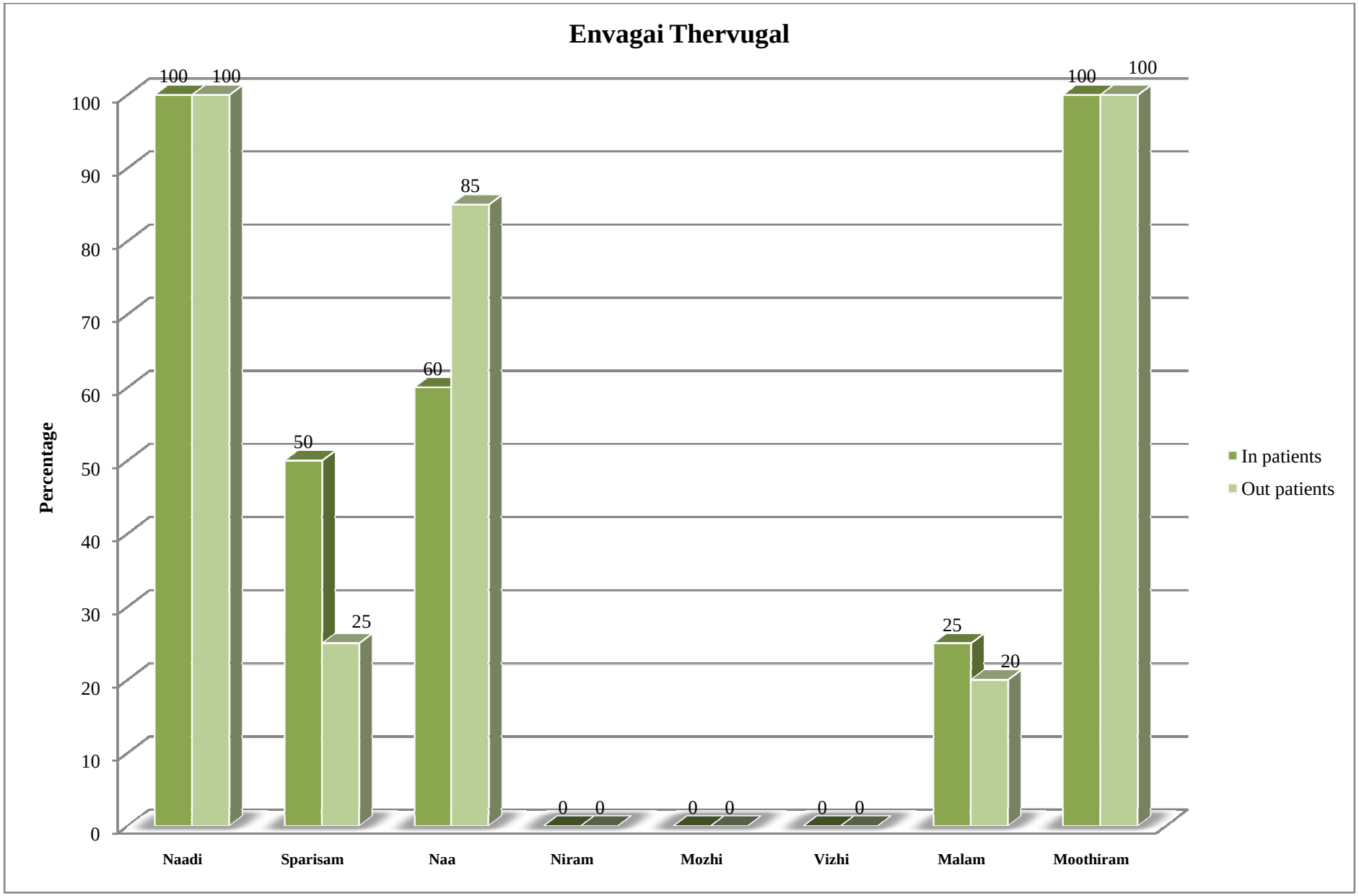

Family History
Percentage
70
60
50
40
30
20
10
0
35
30
25
30
30
15
10
25
Paternal
Maternal
Both
No relevant history
Out patients
Inpatients


Clinical Manifestations
Percentage
100
90
80
70
60
50
40
30
20
10
0
100 100
100
100
80
100 100
35
50
40
60
100
25
50
20
0 0
0 0
Polyuria
Polyph...
Polydip...
Nocturia
Weight...
Pain
Tiredne...
Periphe...
Ulcerat...
Blurrin...
Inpatients
Out patients

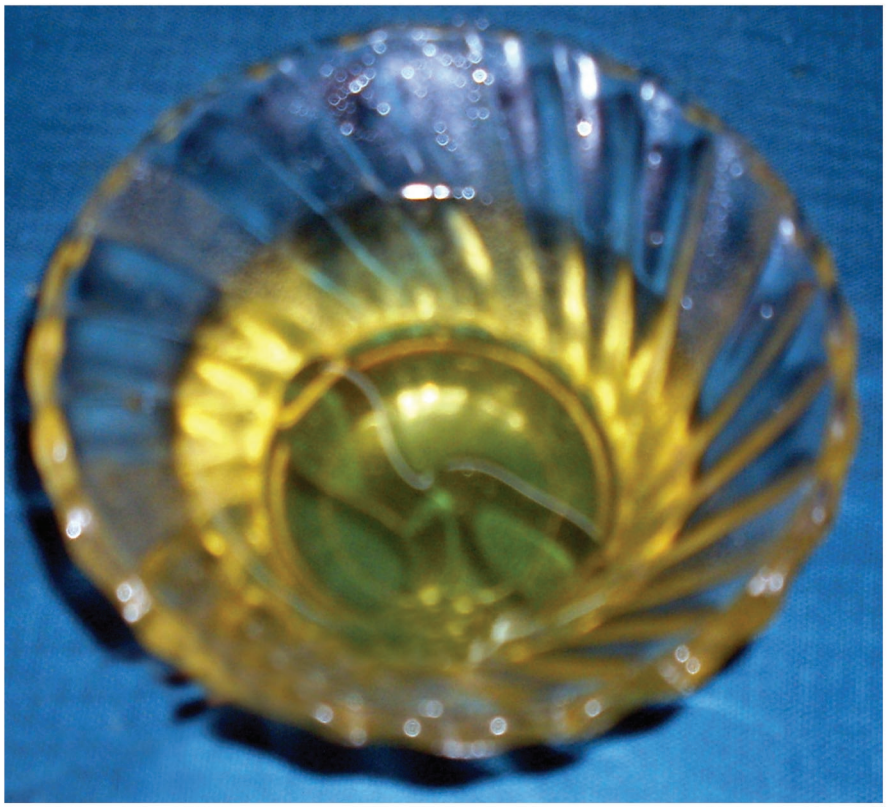

Kosam
100
90
80
70
60
50
40
30
20
10
0
100
100
0
0
40
35
30
30
0
0
Annamaya Kosam
Pranamaya Kosam
Manomaya Kosam
Vingnanamaya Kosam
Ananthamaya Kosam
In patients
Out patients


Disturbances in Pitham
Percentage
180
160
140
120
100
80
60
40
20
0
100
75
25
20
0
0
0
Anarpitham
Ranjagapitham
Prasakapitham
Alosagapitham
Sathagapitham
Out patients
In patients

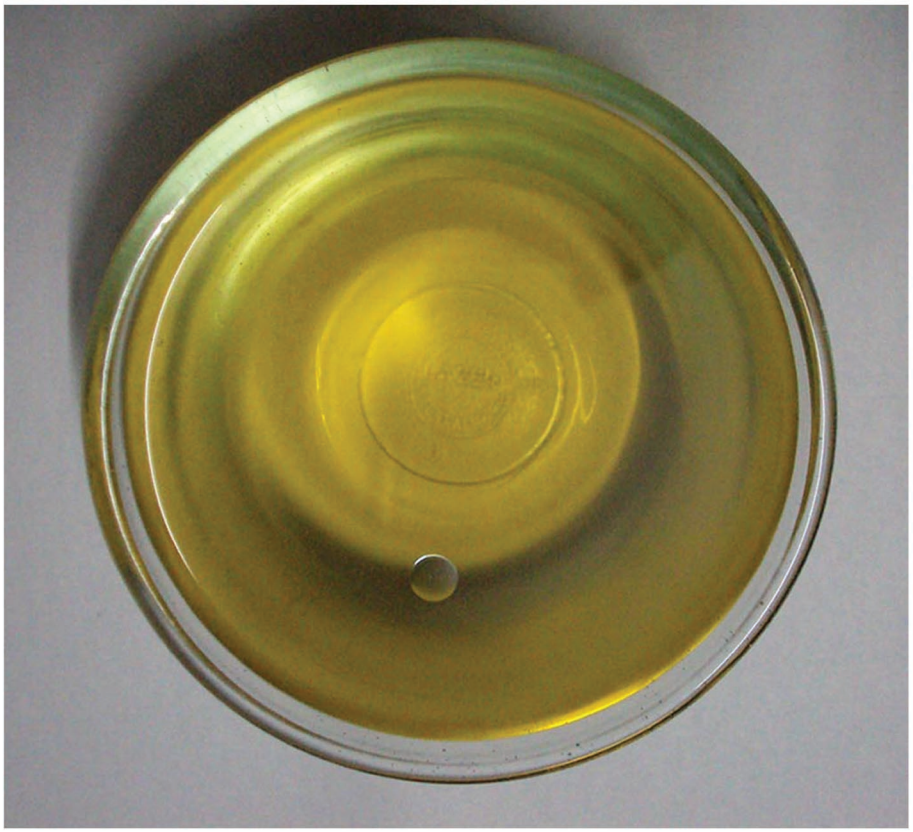

Disturbances in Kapham
Percentage
100
90
80
70
60
50
40
30
20
10
0
100
75
45
35
0
0
0
0
0
0
Avalambagam
Kilethagam
Pothagam
Tharpagam
Santhigam
In patients
Out patients


Envagai Thervugal
Percentage
100
90
80
70
60
50
40
30
20
10
0
100 100
50 25
60 85
0 0
0 0
0 0
25 20
100 100
Naadi
Sparisam
Naa
Niram
Mozhi
Vizhi
Malam
Moothiram
In patients
Out patients

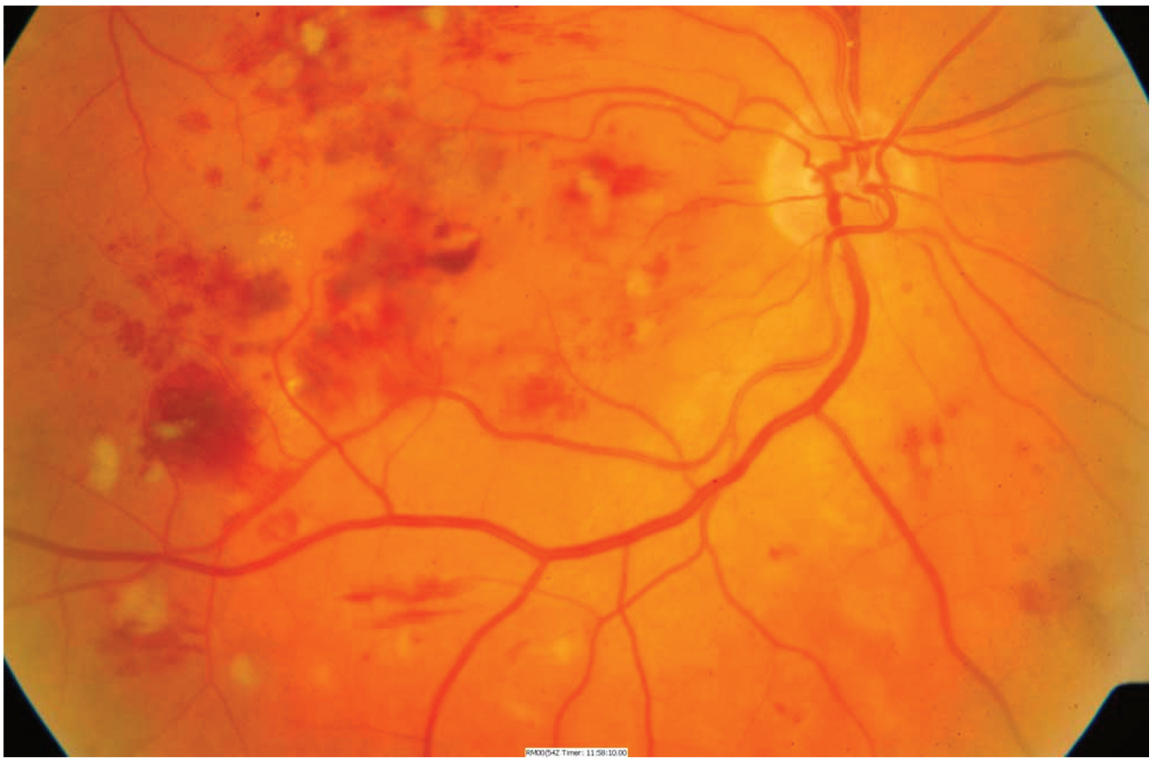
நெய்க்குறி
வாத நீர்



கப நீர்

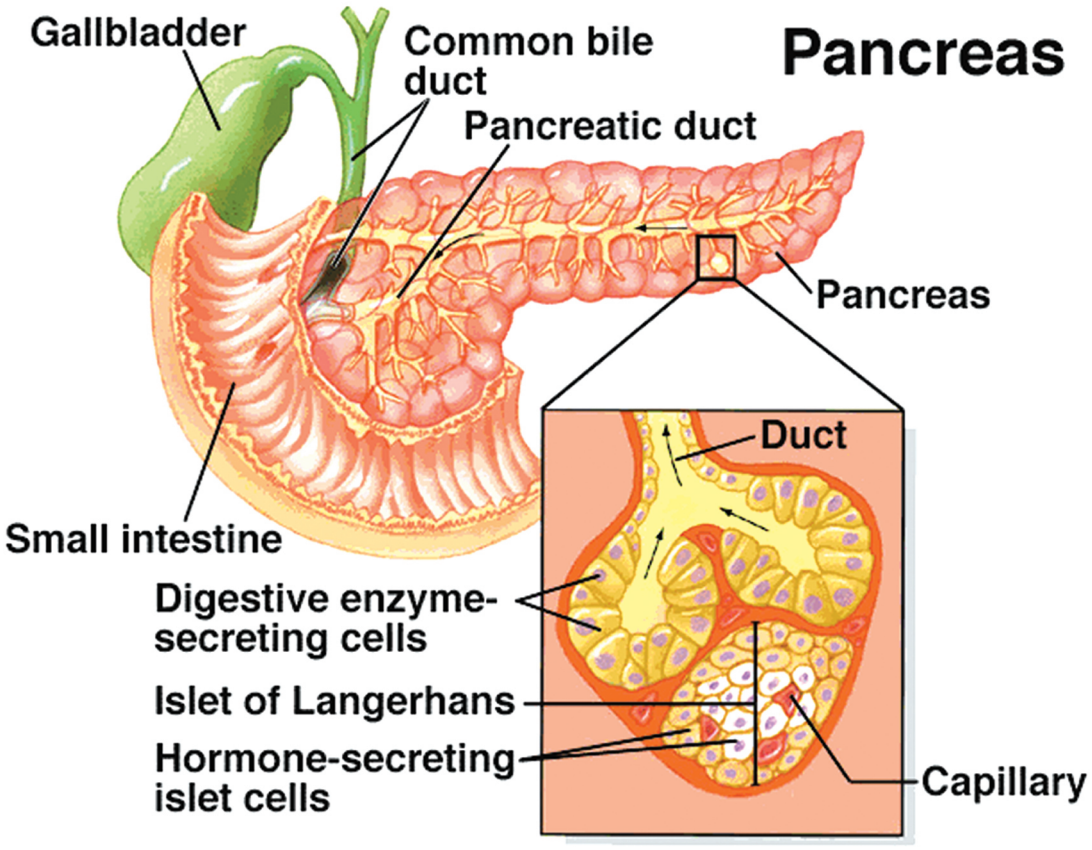


DIABETIC RETINOPATHY



DIABETIC FOOT

ANATOMY OF THE PANCREAS



Chakkaraasanam

Pachimothasanam

Sarvangasanam

Mayurasanam

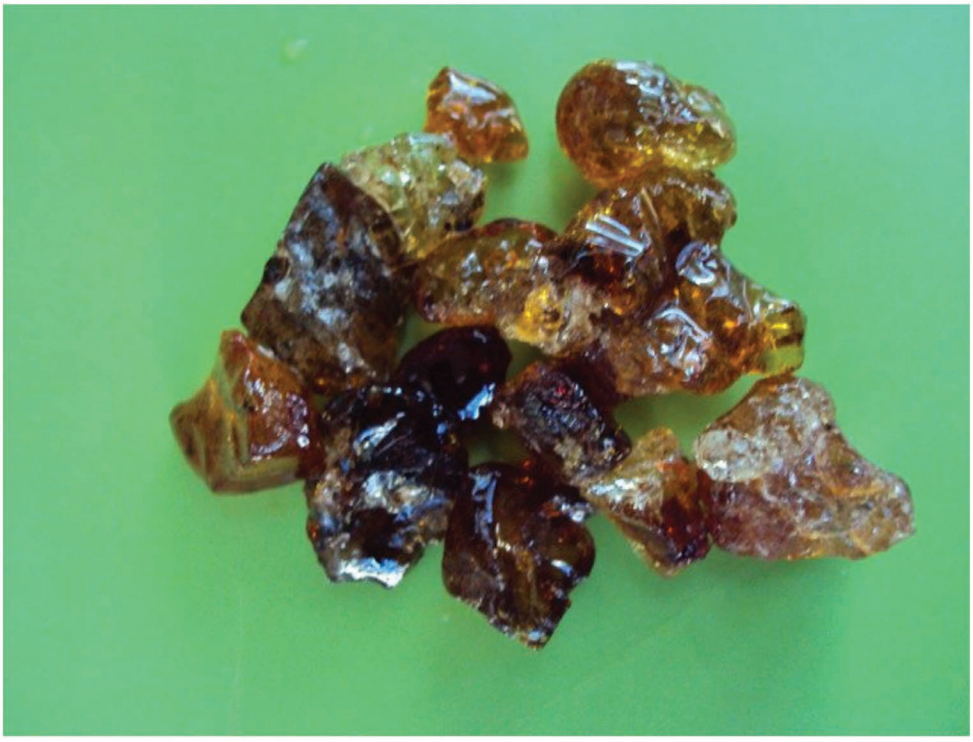
Pujangasanam

Dhanurasanam

நீரிழிவு சூரணம்

கடுக்காய்த் தோல்

விளாம்பிசின்



ஆவாரை விதை

தேற்றான் கொட்டை